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ABSTRACT

Following a presentation of suggested steps for preparation of a secondary school building program, state laws governing the construction of school buildings in Texas are quoted. Design and plan considerations for the administrator and the board of trustees are discussed. An outline of preparation and content of educational specifications is presented, and recommendations are made regarding secondary school sites and facilities. (FS)

ED037947

PRELIMINARY GUIDE FOR PLANNING A SECONDARY SCHOOL BUILDING PROGRAM

EF 004 122

TEXAS EDUCATION AGENCY
Austin, Texas
June 1969 (Revised)

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Reviews of the local educational agency pertaining to compliance with Title VI, Civil Rights Act of 1964, will be conducted periodically by staff representatives of the Texas Education Agency. These reviews will cover at least the following policies and practices:

1. Enrollment and assignment of students without discrimination on the ground of race, color, or national origin.

2. Assignment of teachers and other staff without discrimination on the ground of race, color, or national origin.

3. Non-discriminatory use of facilities.

4. Public notice given by the local educational agency to participants and other citizens of the non-discriminatory policies and practices in effect by the local agency.

In addition to conducting reviews, Texas Education Agency staff representatives will check complaints of non-compliance made by citizens and will report their findings to the United States Commissioner of Education.

PREFACE

The greatest challenge in school construction today is to perfect facilities for current educational programs while allowing for changes in teaching methods and the development of yet-to-be instructional materials.

We can today see the need for flexibility and adaptability with the use of instructional television, electronic teaching devices, attention to individualized instruction, needs of the handicapped in special education, and the adoption of a comprehensive program of instruction.

In planning a high school, it might be well to begin with the instructional center and make it as adaptable as possible to any teaching situation. The resource center should be a part of this unit with seminar rooms adjacent for small and large group sessions.

The building design should consider variable-sized instructional groups, team teaching, use of television and other audio-visual equipment, area vocational units and accommodations for the handicapped.

TABLE OF CONTENTS

PREFACE iii

TABLE OF CONTENTS iv

INTRODUCTION v

SUGGESTED STEPS FOR PREPARATION OF A SECONDARY SCHOOL BUILDING PROGRAM 1

STATE LAWS GOVERNING THE CONSTRUCTION OF SCHOOL BUILDINGS 7

ARTICLE 6066d -- Liquefied Petroleum Gas Code 7
ARTICLE 3271a -- Registration of Professional Engineers 7
ARTICLE 4477-1 -- Minimum Standards of Sanitation and Health Protection Measures 8
ARTICLE 2752a -- Bidding Requirements 8

DESIGN AND PLAN CONSIDERATIONS FOR THE ADMINISTRATOR AND THE BOARD OF TRUSTEES 10

EDUCATIONAL SPECIFICATIONS (An Outline of Preparation and Content) 20

RECOMMENDATIONS FOR SECONDARY SCHOOL SITES 24

FACILITY RECOMMENDATIONS FOR SECONDARY SCHOOL BUILDINGS 29

ADMINISTRATIVE AREAS 30

INSTRUCTIONAL AREAS 32

ACTIVITY AREAS 42

MISCELLANEOUS SERVICE AREAS AND ITEMS 46

OTHER BUILDING CONSIDERATIONS 49

SIZES -- BUILDINGS AND AREAS 51

INTRODUCTION

In response to numerous requests from school boards, superintendents, architects, and others for recommendations on planning secondary schools, the School Plant Section, Division of Administrative Services, Texas Education Agency, has compiled the information in this publication. The function of the School Plant Section is to cooperate with other divisions of the Agency in formulating recommendations and suggestions to assist local school boards, superintendents, and architects in providing additional or improved school plant facilities for the children of the community. The School Plant Section also conducts surveys of existing school facilities and makes projections of student population to assist in determining the future school plant needs of the district.

The recommendations to be found in this publication may seem idealistic. However, it is the intent of the School Plant Section, in its attempt to upgrade the quality of all schools in the state of Texas, to make available the latest information on the sizes and areas needed or desired. This information will provide a basis on which the inexperienced can begin school plant planning. It is recognized that not all school districts will be able to include all items suggested. However, believing that all communities want the best possible educational program and school facilities, this material has been prepared as a guide for making decisions on what can be provided.

Great care should be exercised in attempting comparisons of school costs. Raw figures do not reveal individual program requirements, bidding conditions, quality of materials, degree of equipping, and other important factors. Only visits to the schools and discussions with those vitally concerned with the projects' conception, design, and execution can prepare the way for meaningful comparisons. Because of sharp increases in construction costs reported during recent years, the contract date is of particular significance, both in establishing the specific bidding period and in providing a base for estimating probable future costs.

J. A. Anderson
Chief Consultant
School Plant Section

C. Lyman Ellis, Jr.
Architect
School Plant Section

SUGGESTED STEPS FOR PREPARATION OF A SECONDARY SCHOOL BUILDING PROGRAM

When faced with the prospect of having to build a secondary school building, it is most important that a thorough study be made of the existing educational situation. The axiom that --

> "...to know what you need,
> you must know what you have..."

is especially true when planning new facilities for an educational program.

One of the most serious problems with current educational facilities stems from the one fact -- they were inherited from decisions made on the spur of the moment or in a time of crisis and do not reflect a decision that was evolved from some previously prepared "long-range" plan.

Furthermore, since the school system is an integral part of the community, the many agencies and civic groups within the community should be involved in the planning of new school buildings. This can be accomplished by the superintendent taking this opportunity to get a number of the school's patrons interested and involved in some of the school's problems by appointing them to various committees to make some of the necessary studies.

For a study of this kind to be meaningful, orderly, and of real value, it must be made in a logical sequence of steps. The suggested steps for planning a secondary school building program are:

1. <u>Analysis of the Present Educational Program</u>

   Here is where "what we have" is determined and this is the foundation for all that is to follow. This analysis should attempt to answer such questions as

   - Does the present program meet the needs of all the students?
   - Is the program as comprehensive as possible, or is it simply a college preparatory program?
   - Are we offering as much in vocational areas as is needed, or that we can afford?
   - What are we doing for those students who will not be going to college?
   - Why do we have so many dropouts?

   In other words, "How good are we doing our job?"

2. Statement of Educational Philosophy and Goals

A statement of the educational philosophy of the school district and the level of achievement desired for all the students should be prepared. This should be designed to show that the needs of all students, whether college bound or not, have been taken into consideration. Such a statement, clearly expressed, will prevent any misunderstanding of the educational goals desired.

3. Analysis of Existing Educational Facilities

Another examination of "what we have" concerns the existing housing that is being provided for the present educational program. This must be thoroughly examined for adequacy or suitability, age, condition, and need of repair. At this point, the persons making this analysis should not concern themselves with new program facility needs.

4. Preparation of Educational Specifications

Probably the most serious weakness of the school facilities program of the past has been the lack of communication between the administration and the architect. To eliminate this weakness, the concept of the "Educational Specification" was devised.

The educational specification is a vehicle by which the educator can set forth the desired educational program in a clear and concise manner. An outline of "How to Prepare Educational Specifications" is shown on page 20. This document then becomes the instructions from the owner on which the architect bases his design. It is of prime importance that all pertinent information pertaining to the educational program and methods of operation be included. This includes instructions on items of material or equipment desired and, equally important, those items of material or equipment that are not acceptable.

5. Selection of an Architect

The selection of an architect should be done early in the program and is one of the most critical decisions the school board will be called upon to make. Before any decision is made, board members should visit a number of schools to see some of the current designs and to gather information on the business operations of those architects they are considering. It is suggested that school boards pare their acceptable list of architects down to three or four before inviting them in for interviews.

Many administrators, not having any experience in a building program, do not understand how an architect can be engaged on a contingent basis. Most architects realize that their help is needed long before election time and that the board cannot pay for services rendered except from bond money. Therefore, nearly all architects are willing to make an agreement contingent upon the passage of the bond issue and to perform work under a "letter of agreement" until such time as a formal contract can be drawn. Details of this agreement will vary according to the parties concerned.

6. Selection of an Educational Consultant

A relatively new but very important member of the planning team is the professional educational consultant. He should be thoroughly familiar with all phases of public school education and also should be able to communicate with the architects employed for the project. This consultant can be of tremendous service in making school facility surveys, assisting in the preparation of educational specifications and aiding the board of trustees and the superintendent in reaching the decisions necessary to get the project underway.

7. Selection of a Financial Advisor

In many districts members of the administration are not familiar with the detailed requirements of holding a bond issue election. If this is the case, it is suggested that a professional representative of a reliable bonding company be employed as a financial advisor. In this capacity he can handle all details of advertising, printing of ballots, etc., related to the calling of a bond election. The fee for this service is generally based on a percentage of the bond program and is fairly uniform throughout the state. Acting in the capacity of a financial advisor does not give him an advantage over others when it is time for the bonding companies to bid on the bonds.

8. Selection of the Site

Select a site with the assistance and advice of the architect. Options on a site can save the district money. Do not become "married" to a site just because it has been donated. Avoid subdivided land when possible and purchase acreage. The site should meet the size and other criteria as shown beginning on page 24.

9. Information to School Patrons

Inasmuch as the successful passage of a bond issue depends upon the approval of the school's patrons, it would seem logical that they should be fully informed about the program. Many schools have found it helpful to involve a number of the patrons in the various aspects of the program by having them serve on committees. They, in turn, can be called upon to inform other members of the community.

Some districts hold meetings for the purpose of briefing certain members of the community on the proposed building program. They, in turn, act as a speaker's bureau to appear before civic groups to promote the program. Each speaker is always accompanied by a member of the board to answer any questions raised that the layman speaker cannot handle.

10. Call the Bond Election

When the board is satisfied with the sketch plans and estimates, knows the district's bonding ability, has determined what funds are available and whether they desire to use them, and are convinced that the community has been fully informed and apparently in favor of the issuance of the bonds, the board should proceed to call the election.

11. Proceeding with Plans

After passage of the bond issue, the board should complete a contract with the architect and instruct him to proceed with plans for the building. These plans should be developed in cooperation with the superintendent and such other consultants as are desired. The architect should meet frequently with the school board to keep the members informed of the progress of the plans and to advise them of the various details contained in the plans. When all planning problems have been cleared, the architect should complete the "working drawings" and specifications. (Note Step 12 below.) The board should then advertise for and receive bids and award the construction contract.

> CAUTION: Do not place limitations on the architect by requiring that the building face the street or that it must be a certain style or shape. This can be detrimental to good school design for the particular site on which the school is to be erected.

12. Getting the Preliminary Building Insurance Rate

Many school districts have been unnecessarily penalized because the State Board of Insurance gave their new building a lower rate, with the resulting higher premium, than was expected. This situation often happens when the administration depends on the architect to be acquainted with all aspects of insurance rating, or when the building is not rated until after it is completed.

To avoid this unnecessary expense which will continue for the life of the building, the following procedure is recommended:

a. The administration should be explicit in instructions to the architect concerning the type of insurance classification under which they want the new building to qualify.

b. The administration should seek information from the State Board of Insurance on specific classifications, especially in regard to those which cause penalties.

c. When the final working drawings have been completed, the administration should instruct the architect to submit them to the State Board of Insurance for preliminary rating. This will enable him to assist the rating department in studying the plans, pointing out pertinent details and answering questions. It will also make it possible for him to learn, first-hand, what points may be causing penalties and what changes would bring about a better insurance rate.

Upon completion of "c" above, the administration should proceed with the advertizing and bidding.

Additional savings in insurance premium costs can be realized by (1) carrying coinsurance for all buildings, (2) purchasing insurance on a deviated schedule, and (3) insuring all buildings under one master policy.

BASIC PROCEDURE SEQUENCE IN A SCHOOL BUILDING PROGRAM

1 PLANT NEEDS ESTABLISHED

2 BOARD AUTHORIZES PLANT SURVEY

3 SURVEY STAFF STUDIES NEEDS

4 SURVEY FINDINGS PRESENTED TO BOARD

5 BOARD EVALUATES SURVEY FINDINGS

6 BOARD PROGRAM POLICIES ADOPTED

7 STAFF TO STUDY FUNCTIONAL LAYOUTS

8 STAFF PREPARES EDUCATIONAL SPEC.'S

9 BOARD ACQUIRES SCHOOL SITE

10 PUBLIC INFORMED OF PROPOSED PROGRAM

11 BOARD EMPLOYS AN ARCHITECT

12 BOARD ESTIMATES FUNDS NEEDED

13 FINANCING PLANS ARRANGED

14 SCHOOL BOND ELECTION CALLED

15 BOARD APPROVES PRELIMINARY PLANS

16 PLAN SITE & LANDSCAPING LAYOUT

17 ARCHITECT COMPLETES FINAL PLANS

18 BOARD APPROVES FINAL PLANS

19 FURNITURE & EQUIPMENT SELECTED

20 ADVERTIZE FOR CONSTRUCTION BIDS

21 RECEIVE BIDS, AWARD CONTRACT

22 SELL CAPITAL OUTLAY BONDS

23 SET UP BOND AMORTIZATION PLAN

24 SET UP TAX RATE FOR BONDS

25 SUPERVISION OF CONSTRUCTION

26 APPROVAL OF SHOP DRAWINGS

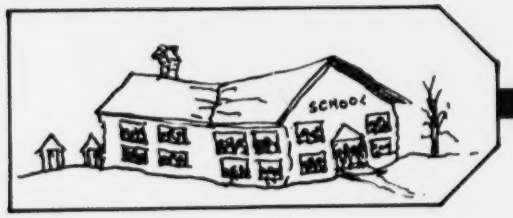
27 PURCHASE FURNITURE & EQUIPMENT

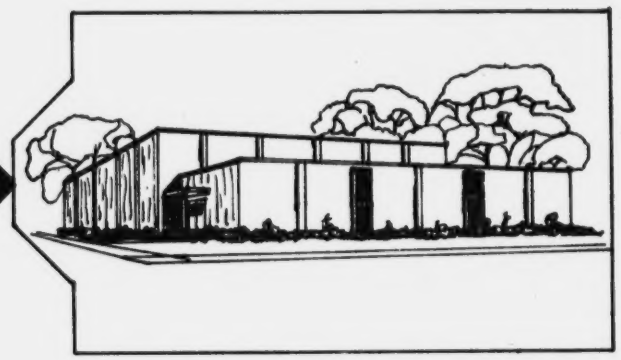
28 LANDSCAPE NEW SCHOOL PLANT

29 INSPECT NEW SCHOOL PLANT

30 ACCEPT NEW SCHOOL PLANT

31 HOLD PUBLIC OPEN HOUSE





STATE LAWS GOVERNING THE CONSTRUCTION OF SCHOOL BUILDINGS

ARTICLE 6066d. Liquefied Petroleum Gas Code

"Legislative Grant of Authority to the Railroad Commission of Texas.

Section 3. A. General. The Railroad Commission of Texas is hereby authorized, empowered, and directed, and it shall be its duty to promulgate and adopt, in accordance with this Act, adequate rules, regulations, and/or standards pertaining to any and all aspects or phases of the LPG industry (except as provided in Subsection D. of this Section) which will protect or tend to protect the health, welfare, and safety of the general public.

License

"Section 5. No person, firm, corporation or association shall engage in the manufacturing, and/or assembling, and/or repairing, and/or selling, and/or installing of containers; nor shall any person, firm, corporation or association engage in the laying or connecting of pipes or piping, including all types of fittings, either in connecting with or to liquefied petroleum gas systems, or with or to house service lines or house pipes, nor in any manner lay or connect pipes or piping, including all types of fittings, to serve a system or appliances, to be used with liquefied petroleum gas as a fuel; nor shall such persons, firms, corporations or associations engage in the service, installation and/or repair of appliances using or to be used in connection with systems using liquefied petroleum gas as a fuel, nor shall such persons, firms, corporations or associations engage in the sale, transportation, dispensing or storage of liquefied petroleum gases within the state except where stored by the ultimate consumer for consumption only, without having first obtained from the Railroad Commission of Texas under the provisions of this Act, a license to do so, except where the LPG so handled is in quantities of less than one (1) gallon United States water capacity and is an integral part of a device for its utilization or where such person is not engaged in business as a dealer in LPG specifically set out in Section 6 hereof. As amended Acts 1961, 57th Leg., p. 579, ch. 273, 1."

ARTICLE 3271a. Registration of Professional Engineers

"Section 19. After the first day of January, 1938, it shall be unlawful for this State, or for any of its political subdivisions, for any county, city, or town, to engage in the construction of any public work involving professional engineering, where public health, public welfare or public safety is involved, unless the engineering plans and specifications and estimates have been prepared by, and the engineering construction is to be executed under the direct supervision of a registered professional engineer; provided, that nothing in this Act shall be held

to apply to any public work wherein the contemplated expenditure for the completed project does not exceed Three Thousand ($3,000.00) Dollars. Provided, that this Act shall not apply to any road maintenance or betterment work undertaken by the county commissioners' court. Acts 1937, 45th Leg.,p. 816, ch. 404."

ARTICLE 4477-1. Minimum Standards of Sanitation and Health Protection Measures

"Section 12. (a) Every person, firm, corporation, public or private, contemplating the establishment of any drinking water supply or sewage disposal system for public use shall, previous to construction thereof, submit completed plans and specifications therefor to the State Department of Health and the said Department shall approve same, provided said plans conform to the water safety and stream pollution laws of this state. The said water supply or sewage disposal system shall be established only after approval has been given by the State Department of Health.

(b) Any governing body of any municipality or any other agency supplying drinking water or sewage disposal to the public desiring to make any material or major changes in any water or sewerage system that may affect the sanitary features of such utility shall, before making such changes, give written notice of such intentions to the State Department of Health."

ARTICLE 2752a. Bidding Requirements

"House Bill No 524
Section 1. The Revised Civil Statutes of Texas, 1925, are amended by adding thereto a new Article, to be known as Article 2752a, which shall read as follows:

Article 2752a. All contracts proposed to be made by any Texas public school board for the purchase of any property, real or personal, shall be submitted to competitive bidding when said property is valued at One Thousand Dollars ($1,000.00) or more. All contracts proposed to be made by any Texas public school board for the construction, maintenance, repair or renovation of any building or for materials used in said construction, maintenance, repair or renovation, shall be submitted to competitive bidding when said contracts involve One Thousand Dollars ($1,000.00) or more. Nothing in this Act shall apply to fees received for professional services rendered, including but not limited to architect's fees, attorney's fees, and fees for fiscal agents. Notice of the time when and place where such contracts will be let and bids opened shall be published in the county where the purchasing school is located once a week for at least two (2) weeks prior to the time set for letting said contract and in two (2) other newspapers that the school board may designate. Provided, however, that on contracts involving less than Twenty-five Thousand Dollars ($25,000.00) such advertising may be

limited to two (2) successive issues of any newspaper published in the county in which the school is located, and if there is no newspaper in the county in which the school is located, then said advertising shall be for publication in some newspaper in some county nearest the county seat of the county in which the school is located." (Effective August 23, 1963.)"

DESIGN AND PLAN CONSIDERATIONS

FOR THE

ADMINISTRATOR AND THE BOARD OF TRUSTEES

As layman in the field of design and planning, many school administrators and board members are often confused by the wild assortment of suggestions that abound when a new building is under consideration.

The following articles were considered to be very good discussions on two often-asked questions on which they will be required to make a decision. These two articles entitled "Single-Story vs Multi-Story, Which is the Best?" and "Which Shape is Best for a New School?" are reprinted from the July and October, 1968 issues, of School Management magazine. These articles are copyrighted.

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SINGLE-STORY
VS
MULTI-STORY
WHICH IS BEST?

Local factors often dictate the decision to build "up" or "out", but certain basic criteria can be applied to all types of school construction. They're explained here.

You can always think of lots of questions to ask the architect when it's time to build a new school. But there's one question that architects hear most often: "Should it be one-story or two-story?"

"Which is *cheaper?*" is often part of it. But the real key is all wrapped up in the answer to another question: "Which is *better?*"

To zero in on this problem, SM editors contacted Sherwood, Mills and Smith, Architects, in Stamford, Conn., who have had much experience in the school field. This article was prepared with their close cooperation; the schools used to illustrate various points were designed by them.

Cost not final factor

Most laymen and many educators, in their innocence, try to draw a comparison between home construction and schoolhouse design. They believe—and, in general, they're right—that a two-story house can be built for a lower square foot cost than a "ranch" structure.

But this generalization cannot be extended to school building, according to Lester Smith, a partner in the firm. Says Smith: "Though cost is the final and not the least important factor in schoolhouse design, it is the aggregate of many other considerations that have to be studied before a decision as to a single-story versus a multi-story school can be made. Each school construction project is unique and the physical and educational factors which determine the number of stories differ from case to case."

On the following pages, you will find an objective presentation of the factors Smith refers to.

FACTORS THAT DETERMINE WHETHER YOU BUILD "UP" OR "OUT"

Educational requirements

When all other things are equal, it is most desirable for younger children to be housed in a school on a single level. The primary school, in particular, should try to provide the child with an easy and natural transition from home to school. In many ways, the single-story school is more consistent with this objective. It is easier to scale to the young child's dimensions. Ceilings and entrances can be made smaller to subdue the impression of size. The child is constantly aware of such reassuringly familiar things as trees, landscaping and absence of height. Greater use of natural light is permitted, thereby lessening the institutional impact of some artificial lighting. When an extremely compact site forces the consideration of a multi-story school, planning should be aimed at placing older children on the upper levels.

Oddly enough, however, if an extremely large elementary school is planned, it is often better to consider two stories. Spreading a single-story school for young children over too large an area often gives an impression of vastness. Long corridors with unbroken wall surfaces have a tendency to awe the child.

Another drawback of the large, one-story school is excessive travel between classes.

At the high school level, children are usually as well served by multi-story as by a single-story building. The number of pupils to be accommodated is an important factor. A good rule of thumb to apply, barring unusual conditions of site, is that a student body of 800 pupils or less indicates a single-story structure; from 800 to 1,200 pupils there is an option; and for 1,200 or more, multi-story is dictated. It is also well to remember that secondary education usually involves travel between classes, and the multi-story plan keeps distances to the minimum.

Site size

The topography and geology of the school site are the most important considerations in determining what kind of school will be built, although the size of the site is also a factor. The practice recommended by most state education departments for elementary schools is a minimum of five usable acres, plus a minimum of one usable acre for every 100 students. For high schools, the general rule of thumb is 10 usable acres plus one usable acre for every 100 students. Contrary to common belief, multi-story construction doesn't save much land space (see diagrams below).

On the other hand, the single-story spread-out campus plan obviously would not be suited to a smaller-than-standard plot.

Topography is a critical factor. A flat piece of land lends itself well to single-story construction since all floors can normally be poured on grade, thus eliminating expensive floor framing and reinforcement. A sloping site dictates a combination of single- and multi-story—the so-called "split level."

Soil conditions are another consideration. Loose or sandy soil with poor bearing characteristics will complicate the foundation for a multi-story structure. On the other hand, excessive rock outcropping or hilly terrain will involve costly land moving, hence multi-story construction may become more attractive.

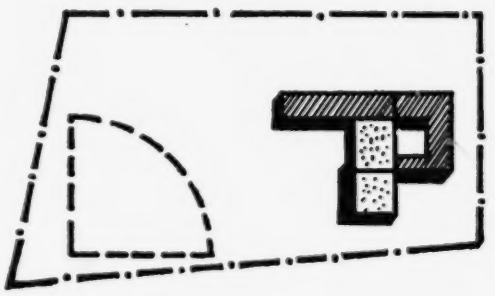
Climate

In most areas of the United States the generally temperate climate permits either single-story or multi-story school construction. Climate becomes a consideration, however, in the more extreme areas. A multi-story structure is generally easier and less expensive to heat than a single-story, spread-out building, and therefore would be preferred in colder climates. In a warmer zone, the single-story school building, with all indoor space directly connected to the outdoors, has positive advantages. The use of outdoor areas as classroom space is facilitated. Ventilation is simplified. Greater utilization of natural lighting is permitted.

Safety factors

Without question, a one-story building is more quickly evacuated in the case of fire than a building

One-story school on 7½ acres.

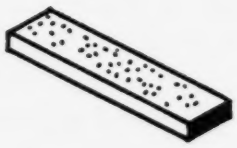


Same site: two-story school.

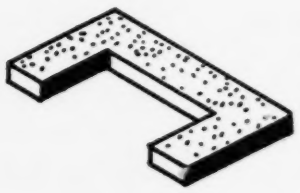
Space saved is minor in one- vs. two-story choice, if site is adequate for either. Only ⅓ acre is saved in example above. Reason: many activities, such as gymnasium and cafeteria, function best as one-story wings, and are designed as such, even in multi-level schools.

WHICH BUILDING IS BEST FOR YOU?

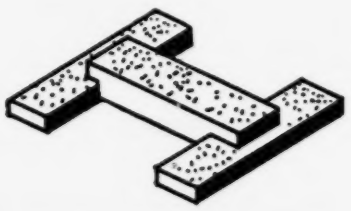
Educational and physical requirements of your school and site call the tune as to whether you build "up", "out", or "up and out." The shapes below represent a cross-section of designs that architects have used to fill individual school needs.



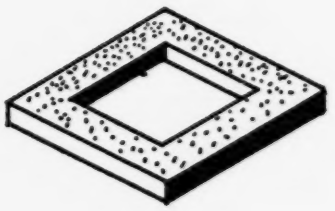
SIMPLE BAR



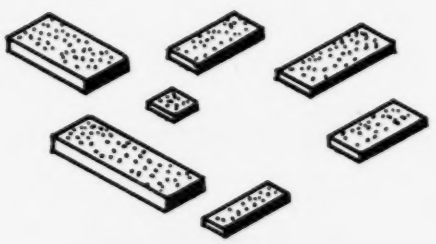
DOUBLE-WING



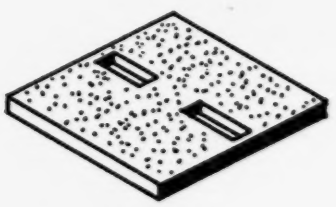
CORE WITH WINGS



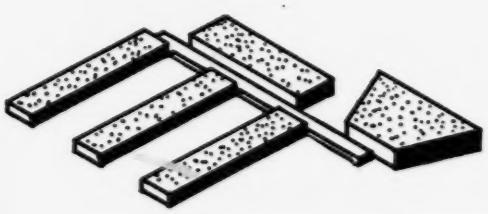
COURT



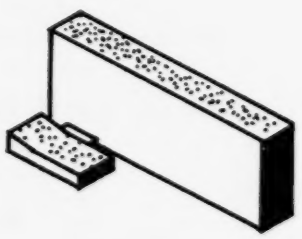
CAMPUS



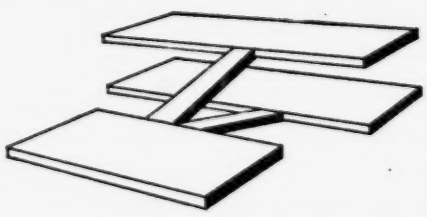
LOFT



FINGER



HIGH RISE



SPLIT LEVEL

Kindergarten activities (with auditorium, gym) are in one-story wing. Intermediate is second story; primary is on floor below.

two or more stories high. The lack of stairways also tends to reduce accidents.

Construction costs

To understand the detailed cost comparison on page 79, a basic understanding of the elements that affect cost is necessary. In building a school, these are the items that are important from a cost standpoint: excavation, foundations, framing, floors, stairs, exterior walls, roofing, heating, plumbing, air conditioning, electrical installation, and maintenance.

Excavation for a one-story school is more costly since a greater land area is involved. On the other hand, foundations for the single-story will be lighter, a saving that is somewhat negated by the fact that they must be longer. In general, the preparation of land and foundation favors the multi-story structure.

A definite advantage accrues to the single-story school, however, in the framing area, where lighter framework is required than for several stories. The same applies so far as floors are concerned. A single-story school requires somewhat less square footage of floor.

In the case of exterior walls, the two types of structures will be approximately the same, with a slight additional cost factor accruing to the two-story building. Roofing is a definite plus for the two-story structure.

Installation of the heating plant and plumbing favors multi-story, but fewer plumbing fixtures are usual in a single-level plant.

Air-conditioning costs are a negligible factor in determining the height of a school. Whether in a one- or multi-story structure, it is the air-conditioning *load* that counts.

Maintenance-wise, the single-story school favors such constant factors as window washing, painting, reglazing, general repairs and floor waxing. Heating, however, is cheaper when one builds upward.

It is also important to recognize that expansion of a single-story school is easier. This is particularly true when the campus plan is involved.

STEP-BY-STEP COMPARISON: ONE-STORY VS TWO-STORY

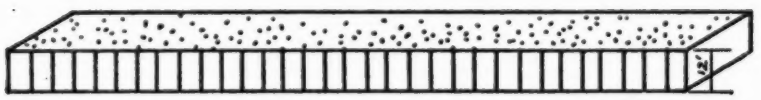
These simplified sketches show a typical 14-classroom wing using one- and two-story design. Facilities in each are about the same. The single-story structure has one set of toilet facilities at the far left, plus a storage room on the opposite side of the corridor. The two-story building requires two sets of toilets, one on each floor, plus two stairwells, one at either end of the wing.

The most apparent difference between the two buildings (see table) lies in the fact that the two-story structure requires 1,728 sq. ft. more space to provide an equal number of classrooms. For example, at $20 per sq. ft., the two-story structure starts off with a $35,000 handicap.

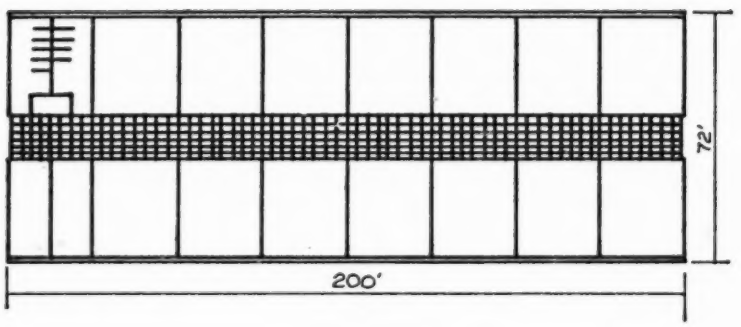
Under ideal conditions, excavation for the two-story building would be about $1,000 less than for the one-story building because of the smaller area involved. Roof area is also less, a considerable saving. This is counterbalanced by the greater exterior wall required in the two-story building and by the cost of building stairways.

The table below details the cost factors under ideal conditions where level land and good soil conditions prevail.

ONE STORY

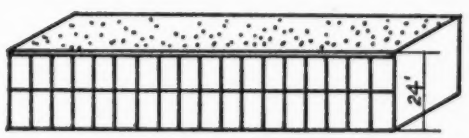


Elevation

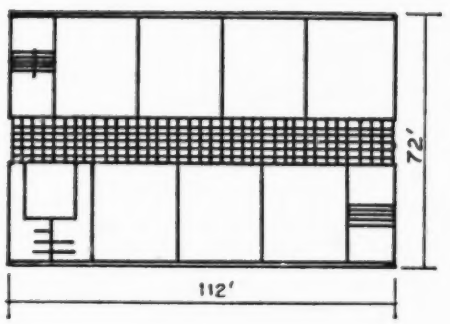


Floor plan

TWO STORY



Elevation



Floor plan

Physical cost factors in one- and two-story construction

	ONE-STORY	TWO-STORY
Excavation	More costly	Less costly
Foundations	Light but long—cost about same	Heavy but short—cost about same
Framing	Lighter—less costly	Heavier—more costly
Floors	14,440 sq. ft.; cheap ground floor	16,128 sq. ft.; costly second floor
Stairs	None—no cost	Two required—costly
Exterior walls	6,528 sq. ft.—less costly	8,832 sq. ft.—more costly
Roof	14,400 sq. ft.—costs more	8,064 sq. ft.—costs less
Heating	Costs more	Costs less
Plumbing	One set of toilets—costs less	Two sets of smaller toilets, slightly more
Electrical	Same	Same

School building portfolio

Design ideas you can use

Which shape is best for a new school?

* Today's new school is likely to look like anything *but* a school.

Snail schools, round schools, amoeba schools, hexagonal complexes—all of these exotically-shaped buildings are based on the premise that a schoolhouse must be tailored to meet the particular needs of its individual program.

This correlation of form and function is all well and good, according to architect Robert J. Schaefer, of Schaefer, Schirmer and Eflin. But, Schaefer cautions, beware of one danger: bandwagonitis.

"Sometimes, too much emphasis is placed on far-out shapes and not enough consideration is given to the rudimentary advantages and disadvantages of the basic configurations available for use in any new school," Schaefer says.

Schaefer offers this not-so-hypothetical example.

Problem: design an elementary classroom complex that has optimum flexibility and convenience for both team teaching and traditional teaching.

Solution: a round classroom unit that opens up into one large room or splits up into six self-contained segments, like slices of a pie.

Rationale: compactness of the circle puts all teachers and students within convenient proximity for fast grouping and regrouping. Self-contained classroom wedges facilitate a traditional teaching program, if desired. Overall economies are realistic in any structure that minimizes building perimeter, which the circular shape does.

Error: excessive circulation space mandated by the circular shape is uneconomical and inefficient. Awkward furniture arrangements are forced by wedge-shaped classrooms. Line-of-sight is not good in the overall complex for large-group instruction. Other basic difficulties—both functional and structural—can torpedoe the *apparent* benefits of the circular shape.

"The architect is the design expert—but any board member or administrator who is involved in planning a new school must be familiar with some of the basic facts about shapes," Schafer says. "This makes it possible for you to ask the right questions—and to evaluate your architect's answers."

On the following pages—a primer on the three basic shapes available for use in school design. It has been prepared by Schaefer especially for this School Building Portfolio.

The circle

The circular module has the advantage of the least perimeter but it also has the disadvantage of excessive circulation areas when the modules are nested (figure 1). Conversely, circulation is constricted at tangential points. Por-

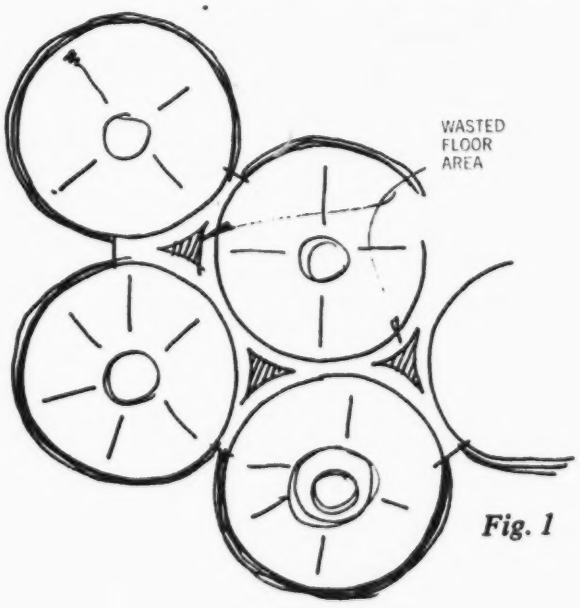


Fig. 1

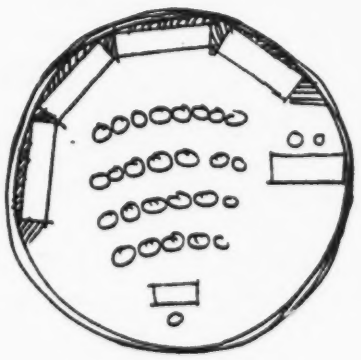


Fig. 2

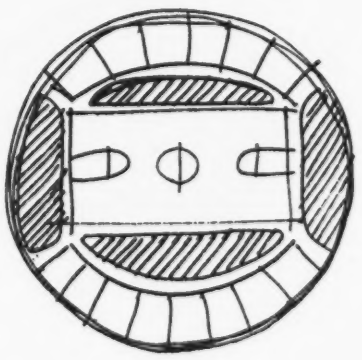


Fig. 3

tions of the excess circulation area can be used for lockers, faculty offices and rest rooms, but the shape of these spaces may be somewhat awkward and unusable. The circular module definitely contributes to poor space utilization if these "grey areas" cannot somehow be made usable.

Internally, the circular module containing several class areas provides as much flexibility as other forms—*if* the module is large enough to provide *gently* curving walls. If the radius is small, however, the curved planes can create awkward furniture arrangement (figure 2).

Wasted space is often created when functions requiring rectangular floor areas are forced into a circular form. One example: a physical education facility with a rectangular basketball court. The area between bleachers and court cannot be used to optimum advantage (figure 3).

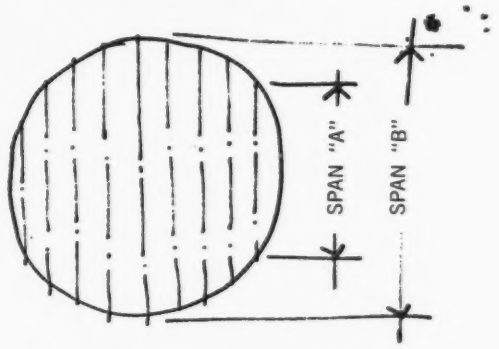
The pie-shaped classroom is a logical result of circular modules. This arrangement has the advantage of placing the student within a more comfortable line of sight with the teacher. However, if the room is relatively narrow, the majority of students are located further from the instructor than in a rectangular or fan-shaped classroom. Furthermore, a radial seating arrangement oriented to the teacher often creates narrow aisles at the front, with aisles at the rear that are wider than necessary (figure 4).

Elimination of fixed partitions and creation of almost totally open space can eliminate some of the previous restrictions (figure 5). With so many items of movable equipment available today, a variety of instructional arrangements can be accomplished.

The circular module can contribute to *structural* complexity and increased costs. Framing systems are most economical when prefabricated elements of similar size and shape can be repeatedly used. The circular shape, however, dictates framing members of different spans and depths (figure 6). If equal spans are utilized, in a radial pattern, the structural members are closer than is required at the center, contributing to material waste. In concrete construction, this problem can be minimized but the same material wastage still exists in the use of forming materials.

This is also a problem in floor covering and ceiling materials—carpeting, floor tile, acoustical tile, etc. Waste occurs whenever right-angle intersections do not occur. Sprayed acoustical ceiling treatments on poured roof structures can achieve reasonable economy on structures of irregular shape. However, formed roof structures which require specialized roofing treatments can be limiting in specification freedom, thus again contributing to higher construction costs.

Future expansion of a school comprised of circular modules, or of a single circular module, is difficult. Additions to the circular building often appear as appendages which are not well integrated into the entire complex (figure 7). The circular module simply cannot be linked as easily to other shapes, such as the hexagon or square. However, major expansion through repetition of the initial module is successful (figure 8). *continued*



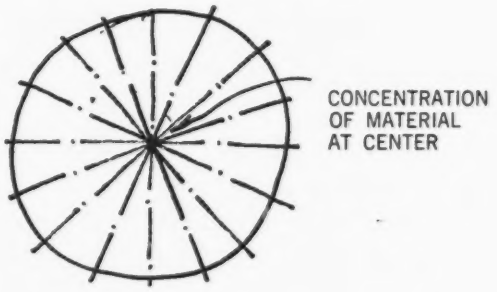


Fig. 6

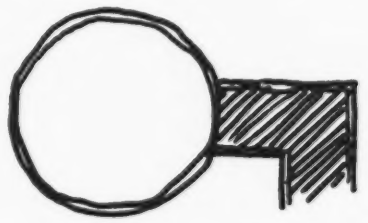


Fig. 7

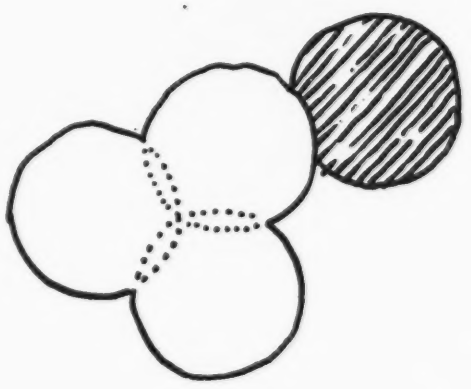


Fig. 8

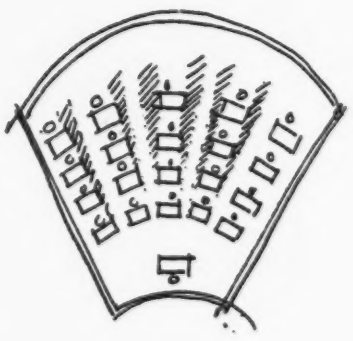


Fig. 4

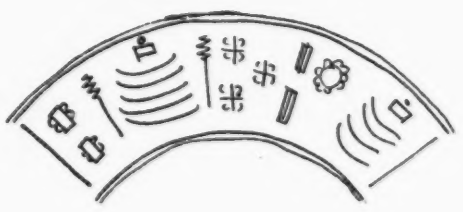


Fig. 5

Which shape is best?

continued

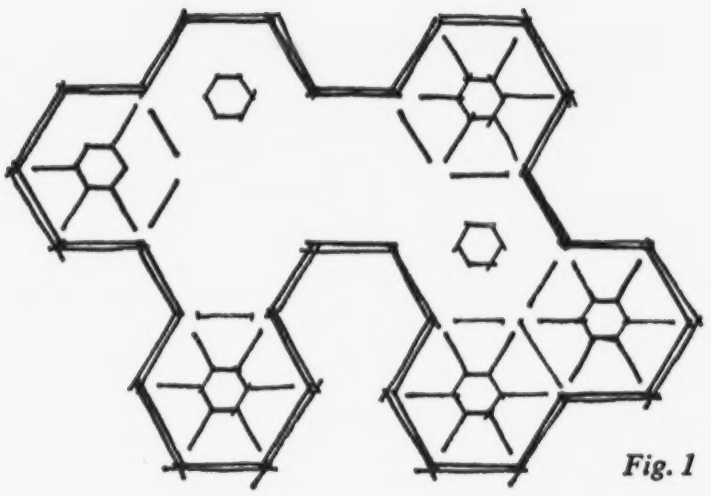


Fig. 1

The hexagon

The hexagonal form has many inherent advantages as a building shape or module. One is the fact that it is formed of "linear" components—the straight-line walls are economical and logical and they provide a convenient modular nesting juncture.

More usable floor area is available in a hexagon than in a circle (figure 1). Furthermore, straight-line walls can be more readily constructed of a variety of conventional materials. They can also better accommodate furniture and equipment without wasted space or unfortunate intersections. Most school furniture and equipment is designed to be grouped in either 90- or 60-degree arrangements, both of which work well with in the hexagonal module's straight-line components.

Although furniture arrangement is reasonably efficient in the fan-shaped teaching space created by the hexagon, some space is lost due to acute angles (figure 2). Also, radial rows of furniture in the hexagon's fan-shaped classroom contribute to the same loss of usable space that occurs in the circle's wedge-shaped classroom (see figure 4, page 27). In general, the variety of seating groups used at the elementary school level make it possible to fully utilize the fan-shaped classroom by placing activity groups in the "dead" corners (figure 3). Many times, however, the chalkboard area of the fan-shaped spaces becomes constricted, due to minimal front wall area. Sidewall chalkboards then become necessary.

The fan-shaped space does achieve better sight-line orientation than the traditional rectangular classroom. Areas other than classrooms, such as physical education facilities, choral and instrumental spaces, seem to work within the hexagon without the excessive wasted space often experienced in the circle (figure 4).

Structurally, the hexagon has some of the same disadvantages as the circular module, but it lends itself more readily to linear components. Framing members can conveniently be placed parallel or perpendicular to perimeter walls to make connections easily and intersections of wall and roof planes more pleasing (figure 5). Also, re-

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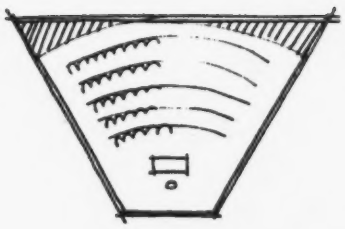


Fig. 2

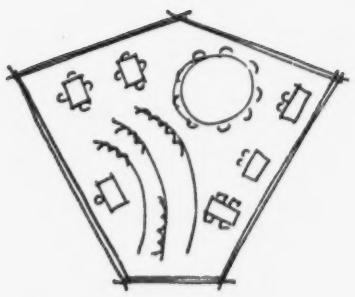


Fig. 3

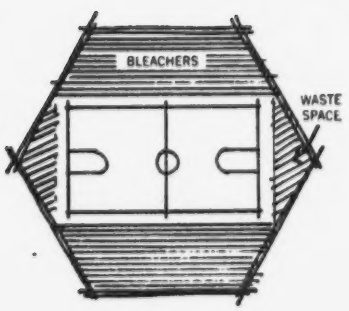


Fig. 4

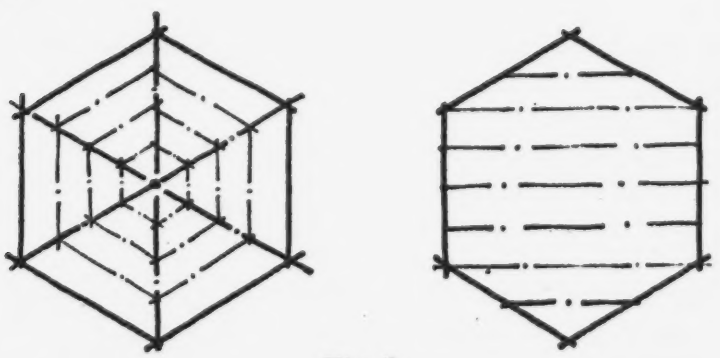


Fig. 5

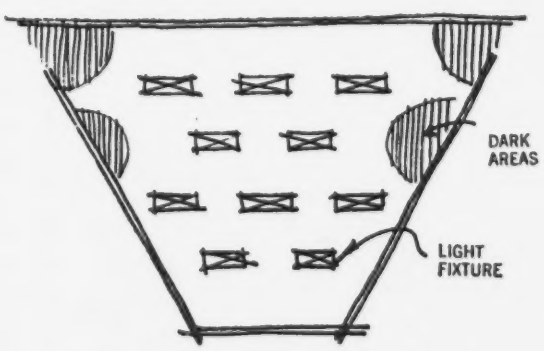


Fig. 6

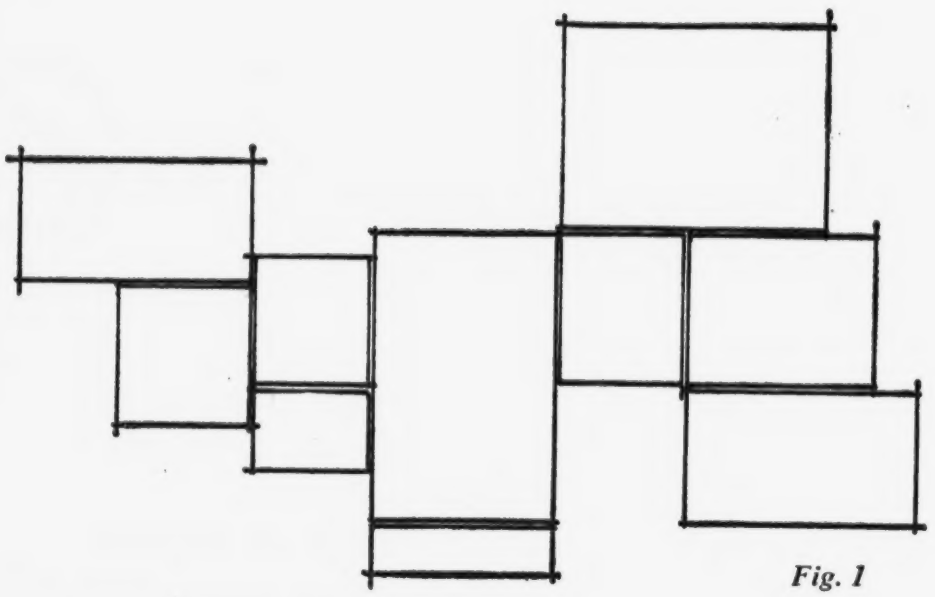


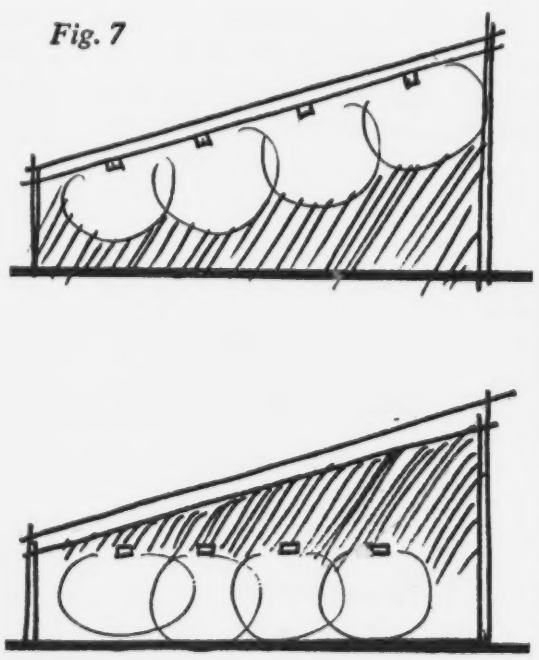
Fig. 1

petitive use of same-sized members is possible to a greater extent than with the circle.

The hexagon contributes less to wastage of other materials than does the circular concept. With carpeting, for example, the cut portions of material from angular spaces can more readily be located elsewhere than is true with a circular space or a section of a circular module.

One major problem with the hexagon: uniformity of lighting is sometimes difficult. If the lighting layout parallels two walls, dark spaces are created adjacent to the non-parallel walls (figure 6). If the roof has an unusual form, such as a dome or pyramid, the increased volume of space is more difficult to light uniformly. If ceiling fixtures are used here, the distance from the light source to the work surface varies, creating varying light levels. Also, suspended light fixtures can harm the interior design effects created by the sloped or domed roofs (figure 7).

Fig. 7



The rectangle

The rectangle is probably the most structurally efficient shape for schools. When teaching spaces are arranged, either individually or in clusters, the nesting of modules is best accomplished within the square or rectilinear form (figure 1). The components of the rectangle are linear elements which have all of the advantages previously discussed with regard to the hexagonal module.

The use of the square or rectangle does *not,* contrary to some current trends, limit the flexibility of interior spaces. Teaching areas can be formed by movable walls, furniture and/or equipment into any desired shape. Rectangular teaching spaces do not have to conform to the rectangular shell (figure 2). However, furniture and equipment arrangement adjacent to walls is most easily accommodated, due to the straight walls and 90-degree corners, and class seating in rows does not result in wasted space (figure 3). True, some unusable seating space will occur at the front of the teaching space; on the other hand, more area of "teaching wall" exists with this arrangement (figure 4).

The square and rectangle lend themselves better than other shapes to economical structural systems (figure 5). Except for concrete structures, which are plastic in form, the majority of construction today is assembled with the flat plane, straight line and 90-degree intersection. Any shape that encompasses these construction standards is obviously easier

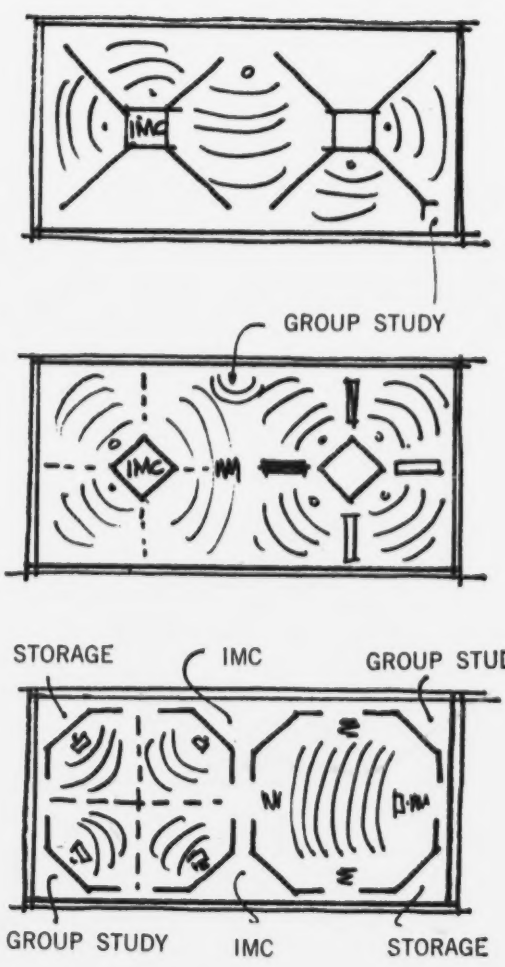


Fig. 2

continued

Which shape is best? *continued*

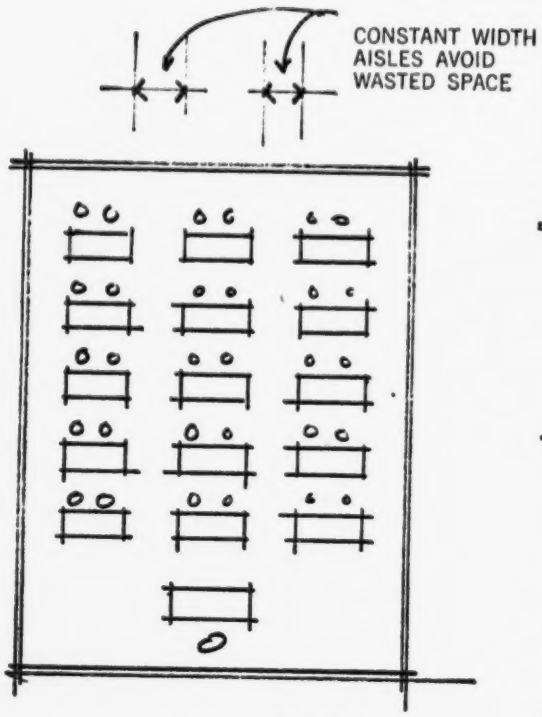


Fig. 3

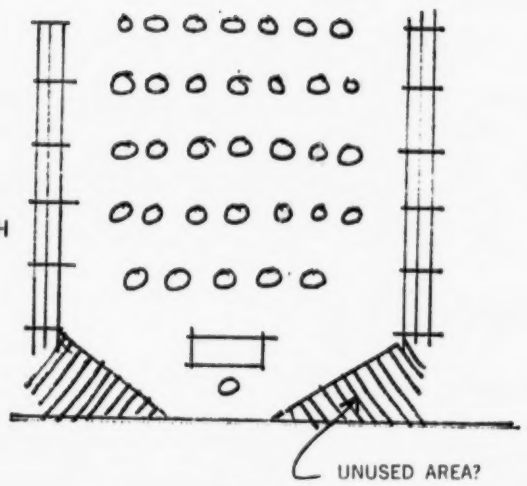
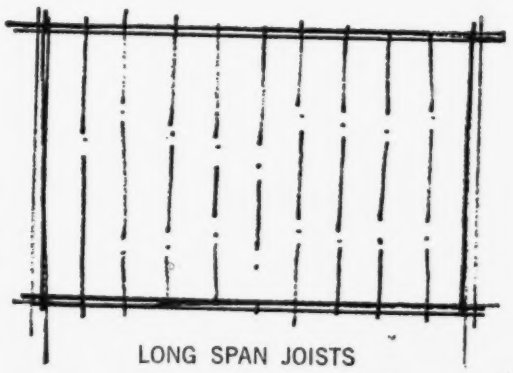


Fig. 4



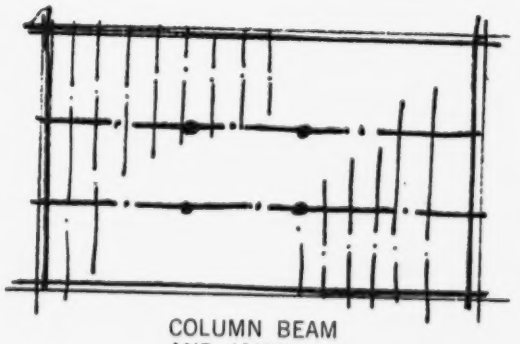


Fig. 5

to build. It is comprised of readily available materials which are conveniently assembled and should, therefore, result in a more economical finished product.

The rectangular module is also the most economical as far as conservation of material. Products such as carpeting, floor tile and ceiling tile are based on a 90-degree corner. Optimum use of these materials occurs in rectangular spaces. Labor costs are reduced by ease of installation. Furthermore, with the 90-degree intersection, the junctures of the various materials will be more logical and, in most cases, more pleasing in appearance.

Future expansion of the rectangular form can be accomplished with relative ease and good appearance. The square or rectangular module allows for flexible expansion by extension of its sides or by the use of repetive elements.

In conclusion . . .

Additional forms and shapes, and various other considerations, could be discussed here. But the circle, the hexagon and the rectangle are basic to the design of any school. The advantages of each are, of course, still relative to what you want to do *inside* your new school. Often, however, the program projected for a new school is highly theoretical. What you need, in order to evaluate the shapes that will be proposed, are some *practical* parameters. Hopefully, this brief discussion of the strengths and weaknesses of the basic shapes provides them. **End**

Shape is one basic ingredient in school design. Whether to build up or out—i.e., single-story or multi-story—is another. This important consideration was discussed in a primer in the July issue of SCHOOL MANAGEMENT. *See "Single-story versus multi-story—which is best?"*

EDUCATIONAL SPECIFICATIONS

(An Outline of Preparation and Content)

1. Definition

Educational specifications include a detailed description of: (1) all the activities that will take place in the buildings, (2) the curriculum to be provided for, (3) specific architectural characteristics desired, (4) the facilities needed--equipment required--and space relationship of these to other facilities, and (5) budget and other governing factors. The community background and history and the educational philosophy of the school district should precede the detailed specifications.

2. Purpose

The preparation of educational specifications serves to:

a. Clarify and consolidate the ideas of the administration, members of the board, and the community on the needs, desires, and objectives of the educational program to be conducted in the proposed new building, and

b. Organize all important information so that it can be easily and clearly interpreted by the architect.

3. Persons Involved and Their Roles in Developing Educational Specifications

a. Board of Trustees

(1) Adopts essential policies.
(2) Approves final educational specifications.
(3) Employs architect.
(4) Provides budget.

b. Superintendent and Administrative Personnel

(1) Designate principal or other professional person as chairman to develop educational specifications.
(2) Provide administrative leadership.
(3) Evaluate progress.
(4) Evaluate final specifications and interpret them to:

- the board of trustees
- the architect
- the community

c. Principal or Other Professional Person Designated

(1) Appoints a steering committee.
(2) Selects teachers and others for each area.
(3) Organizes each group.
(4) Coordinates work of all groups.
(5) Arranges for services of all available consultants.
(6) Organizes and edits final draft of educational specifications.
(7) Reports through appropriate channels to the superintendent.

d. Teachers and Others Selected to Participate

(1) Describe special characteristics required for each teaching space.
(2) Describe activities for each space.
(3) Describe characteristics and needs of pupils involved.
(4) Describe type of furniture, equipment, instructional materials, and aids to be used in specific areas.
(5) State desirable relationship to other spaces.
(6) Describe pupil groupings to be used in each space.

e. Instructional Supervisors and Consultants from State Department of Education, Colleges and Universities, Professional Groups, Specialized Equipment or Materials, and Others

(1) Advise with teachers on needs of the instructional program.
(2) Provide guidance, resource materials, and planning information.
(3) Interpret implications of recent trends in education.

f. Members of the Student Body

(1) Advise on special student needs in regard to special activities, academic requirements, aspirations and goals, and added courses of study desired.

g. Citizens' Groups

(1) Furnish information on background and wishes of the community.
(2) Serve on committees if selected.
(3) Interpret as to the community work being done.

h. Architect Selected for the Project

(1) Serves as advisor on technical, aesthetic, and cost considerations.
(2) Advises on those items which have unusual implications for design.
(3) Observes in order to become acquainted with the total problem.

4. Elements of Educational Specifications

PART I should be prepared in advance and should contain statements pertaining to:

a. A description of the community such as

- historical background
- cultural background
- socio-economic status
- population and trends

b. Educational philosophy and policies of the school district

- educational goals for students
- educational organization of schools and reasons why

PART II should delineate the educational program of the school plant being planned and should include information on:

a. The organization of the school such as

- pupil capacity by grades for initial and ultimate enrollment
- initial and ultimate number of classrooms
- maximum group or class size
- learning activities to be provided
- auxiliary areas to be provided -- i.e., central library, cafeteria, administrative elements, auditorium, gymnasium, or others
- community use of facilities
- summer use of the school plant
- extracurricular activities

PART III spells out in detail the specific school plant requirements for each itemized area giving:

a. Activities of each area and number of students involved
b. Space requirements with the necessary furniture, equipment, (both built-in and movable), and storage facilities
c. Utilities and services with special requirements designated in addition to normal needs
d. Environmental factors -- heating, lighting, ventilation, acoustical requirements, color, and decoration
e. Special requirements and characteristics not otherwise stated
f. Relationship of spaces required or preferred
g. Internal traffic -- movement of students with numbers and routes
h. Any general architectural characteristics desired

In secondary schools special consideration should be given to the following areas when writing educational specifications:

- Art
- Assembly
- Audio-Visual
- Business education
- Home economics
- Library
- Music
- Physical education
- Science
- Shops (vocational and industrial)

PART IV should comment as necessary on the following miscellaneous considerations:

- Bus-loading facilities
- Outdoor paving and furniture
- Planting
- Fencing
- Storage lockers
- Coat racks
- Floor materials
- Floor markings
- Floor mats
- Folding gates
- Display facilities
- Wall materials
- Tacking surfaces
- Ceiling materials
- Acoustical
- Colors
- Skylights
- Plumbing fixtures
- Hardware
- Shower-room arrangement
- Custodial and mechanical equipment rooms
- Cleaning systems
- Fire-fighting equipment
- Hose bibbs
- Public telephones
- Intercom systems
- Program Bell system
- Clock system
- Fire-alarm system
- Outdoor lighting
- Others

PART V should give information on the proposed budget such as:

a. Total amount of money available for this project

b. Approximate amount to be allocated for

- site acquisition
- building construction
- site development
- architectural and engineering fees
- furnishings and equipment
- contingencies

RECOMMENDATIONS FOR SECONDARY SCHOOL SITES

(The following paragraphs are excerpts from the 1964 edition of the *National Council on Schoolhouse Construction guide for planning school plants.)

SITE SELECTION AND DEVELOPMENT

"Site selection is primarily a technical and aesthetic problem, requiring cooperative efforts and special skills of school officials, architects, and engineers, recreational experts, urban planners and legal consultants . . . .

"Some of the basic data required for long-range planning leading to actual site selection can be obtained from:

a) A land use map--to show areas zoned for various purposes and actual use. It is available in most communities which maintain a permanent and full-time planning force.

b) Aerial photographs--these help to identify likely areas for school sites.

c) Soils map--to guard against the purchase of land areas where subsoil characteristics may increase foundation costs or compound drainage problems.

d) Topography map--to help identify the terrain and likely areas of population concentration.

e) Highway and major road maps and plans--to chart vehicular and pedestrian traffic flows.

f) Flood control maps--to aid in determining areas flooded during various disasters.

g) Preschool or pupil spot map--to show location of pupils of various ages.

h) Dwelling maps--to spotlight the types and numbers of various dwellings.

i) School service maps--these indicate existing school locations and attendance unit boundary lines.

j) Utility service plans--to show locations of present and proposed water, gas, and electric services.

"Sites of inadequate size have been one of the primary causes of early school building obsolescence and curtailed school-community programs.

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*The National Council on Schoolhouse Construction organizational name has been changed to Council of Educational Facility Planners.

"The following criteria serve to summarize factors of importance in evaluating a proposed site:

1. The site should be large enough to accommodate adequately the necessary buildings and to provide ample space for outdoor instruction and recreation, for parking, and for future expansion of buildings and play area.

2. The site should be readily accessible to children who will attend the school and also to the general public for community use.

3. The site should be so located that water, sewers, electricity, and other utilities can be provided at reasonable costs.

4. The site should have an elevation and contour which will insure good drainage and a type of subsoil which provides a good base for building footings and foundation.

5. The site should be selected with due regard to its proximity to public recreational, educational and cultural facilities such as parks, libraries, and musems.

6. The site should be attractive, lend itself readily to landscaping and provide a pleasing and beautiful natural environment.

7. The site should be purchased before the need becomes critical.

"The necessity for larger sites is due to a number of trends such as: (1) increased usage of outdoor teaching areas, (2) construction of expansive, single-story structures, (3) use of single-loaded corridors, (4) designs providing campus and cluster-type building layouts, (5) use of the little-school, or the school-within-a-school concept of school organization, (6) consolidation of attendance areas resulting in larger schools, more buses, and regulations and practices requiring on-site bus loading and unloading, and (7) automobile parking space for the ever-increasing number of teacher and pupil cars.

"While it is recognized that for many schools much larger areas are preferred, the acceptance of the following suggestions [interpreted as MINIMUMS] will be an improvement for many of the schools throughout the country:

1. For elementary schools, it is suggested that there be provided a minimum site of 10 acres plus an additional acre for each 100 pupils of projected ultimate maximum enrollment. Thus the site of minimum size for an elementary school of 200 pupils would be 12 acres.

2. For junior high schools, it is suggested that there be provided a minimum site of 20 acres plus an additional acre for each 100 pupils of projected ultimate maximum enrollment. Thus a site of minimum size for a junior high school of 500 pupils would be 25 acres.

3. For senior high schools, it is suggested that there be provided a minimum site of 30 acres plus an additional acre for each 100 pupils of projected ultimate maximum enrollment. Thus, the site of minimum size for a senior high school of 1,000 pupils would be 40 acres."

1. Small Site Land Usage

There may be circumstances where a school district is unable to obtain more than a very limited site in an area that must be provided with a school. In this event, to make the maximum use of the land available, it may be possible to:

a. Elevate the structure so that one or more play areas are available beneath it.

b. Construct a multistory building with elevators or moving stairs.

c. Put play areas on other floors or on the roof.

d. Build some facilities such as heating plants, parking, and storage underground or remotely located, or

e. Place parking areas under stadia or other buildings which have a high degree of community use.

Also, for the maximum use of limited playfields and outdoor instructional areas they should be scheduled to provide for:

a. Multi-use of the same area at different times of the day or during different seasons, such as having football practice fields, baseball practice fields, or areas for unorganized play in the same space.

b. Stagger recreational periods so that only a portion of the student body would be on the playfields at any one time.

c. Build the school adjacent to a public park or playground which could be periodically used for school purposes.

d. Provide fields for athletic practice and games in an outlying area where land is less expensive.

2. Factors for Setting Geographic Boundaries of School Unit Areas

Sites should be selected where a growth or spread of population is anticipated so as to avoid undue overlapping of areas to be served by the different schools. In attempting to determine the geographic boundaries of such areas, at least five factors should be considered:

a. Grade range for each school

b. Permissible type of residential development (as it may affect the probable number of children per unit of area).

c. Policy of the school district concerning transportation of children.

d. Hazards and natural barriers which affect the accessibility of a given school.

e. Policy as to maximum school enrollment.

3. Criteria for Site Selection

a. Suitable Environment

(1) Freedom from business areas, railroad, airfields, airstrips, factories, through highways, odors, and possibilities of future contamination.

b. In cooperation with community plan

(1) Remote from churches and hospitals
(2) Accessible to adult use
(3) Fitting pattern of other school locations

c. Accessibility

(1) The building located in an area where the maximum walking distance is one and one-half miles for junior high students and approximately two miles for senior high students.
(2) A safe approach for all modes of travel -- walking, bicycling, and motoring.

d. Suitable site topography

(1) Square shape if possible
(2) Good surface drainage
(3) Free from hazards or unsightly structures
(4) Pleasant views at close range and at a distance
(5) Easily adapted surface for various uses
(6) Abundance of natural resources such as trees, water, and good elevation
(7) Absence of excessive fill, rock, or subsurface water condition
(8) Good foundation base

e. Consideration of utility services

(1) Accessible to water, gas, electricity, and sewer lines

f. Cost factors

(1) Comparable to cost of adjacent land
(2) A minimum amount of grading and filling needed
(3) Reduction of costs by salvaging buildings on property
(4) Minimum need for street paving and sidewalk installations

4. Requirements of Orientation and Daylighting

a. Size and shape of site must permit proper orientation of building.

b. Classroom buildings should be oriented for best possible ventilation and daylighting regardless of locations of streets or land topography.

c. Buildings that are not climate controlled should be oriented with corridors running east and west to give the classrooms north and south exposures.

d. The classroom windows should be shielded on the east and south from direct sunlight and on the north from sky glare. Classroom window walls exposed to the west should be avoided. It is important that glare spots be reduced and eliminated if possible. Tinted, glare-reducing glass in windows is recommended.

FACILITY RECOMMENDATIONS
FOR SECONDARY SCHOOL BUILDINGS

The term "secondary schools" as used herein shall be those plants housing grades 6-12. The academic division of the grades, whether it be 3-3, 2-4, or 0-6, is not a determining factor of the elements to be included in the plant, but does affect the extent of these elements.

The following information of the various elements is designed to apply particularly to the upper three or four grades--or senior high school. For the lower two or three grades--or junior high school, the same elements should be considered but should be somewhat modified as determined by the school program, size of student body, location relative to the senior high school, etc.

Elements of a Secondary School

ADMINISTRATIVE AREAS

INSTRUCTIONAL AREAS

- Academic Classrooms
- Specialized Instructional Areas

ACTIVITY AREAS

- Cafeteria or Cafetorium
- Gymnasium or Gymatorium
- Auditorium
- Outdoor Areas

MISCELLANEOUS SERVICE AREAS AND ITEMS

OTHER BUILDING CONSIDERATIONS

- Economical versus Cheap Construction
- Climate-Controlled Building
- Carpet Floor Covering
- Preparation for Television Installation
- Lighting Values

SIZES -- BUILDINGS AND AREAS

- Suggested School Site Sizes
- Suggested School Sizes
- Suggested Square Footage Per Pupil Per Teaching Station

ADMINISTRATIVE AREAS

The administrative areas under consideration in this guide are those which come under the direction and control of the principal and serve to carry on the educational program contained within the building. Administrative areas for the superintendent and business or tax office are not included in this discussion since they are not an integral part of a secondary school building. However, if these administrative offices are to be located in the high school building, they should be situated where they are accessible to the public but away from the principal's office.

The amount and type of space required for the administration of a secondary school building will be influenced by the:

- Number of students served
- Educational program
- Community use of the school

The administrative area should be located near the main entrance and, in general, will include the following:

- General Office -- with waiting space for visitors
- Principal's Office
- Storage Area for Supplies and Records Vault
- Guidance and Counseling Offices
- Clinic
- Conference Room
- Book Room
- Departmental Offices for Teachers
- Teachers' Workroom
- Other Facilities
- Storage

General Office

The routine business of the school will be performed in the general office which should contain the necessary furnishings and equipment for the efficient conduct of business. This office should open directly into the corridor, the principal's office, record vault, and the supply room. The control unit of the school's radio and public address system, the master clock, and the main telephone are usually located in this office. A comfortable waiting space for visitors may also be provided.

Principal's Office

Although the principal's office should be private, it should be inviting and accessible from the general office. It is desirable for this office to have private toilet facilities and a storage closet. Usually from 120 to 150 square feet of floor space is adequate.

Storage for Supplies and Record Vault

Provisions should be made for the storage of office and school supplies convenient to the general office. A vault with a two-hour fire rating is needed for the safekeeping of valuable records. The size of these areas will be determined by the volume of supplies and the method in which they are used. Natural lighting is not essential for these areas but they should be well ventilated.

Guidance and Counseling Office(s)

The guidance and counseling office(s) should consist of a waiting room, secretarial space, and one or more offices for private interviews with students and/or parents and teacher-parent conferences. These facilities should not be located near the principal's office but interoffice connection should be provided. The entrance and waiting room for the principal's office should not also serve the counseling office since such an arrangement may discourage students from making voluntary visits to the counselor.

The extent and area of the guidance facilities will be determined by the guidance program being carried on by the school system but they should be designed and furnished to produce a pleasant and relaxed atmosphere.

Medical Clinic

Since the school clinic needs to be centrally located, it is usually considered a part of the administrative area. The minimum facilities should include a waiting room and an examination room with adjoining restroom and storage closet. Space for at least one cot should also be provided. If the school conducts eye examinations, the length of the room should provide for the proper use of an eye chart.

Conference Room

A conference room of approximately 400 square feet is very desirable. It should be connected to the general office and the corridor. A coat closet and toilet facilities may be provided.

Book Room

Each school building should have a central book room for receiving, storing and issuing of State-supplied textbooks. It should be located near the principal's office, since he is responsible for textbook accounting, and should be provided with suitable shelving to hold all the books issued to the school, plus approximately ten percent additional. (Estimates of shelving needed should be based on 24 volumes per three feet length of shelf.)

Departmental Offices

Many schools, operating on a departmental basis, have found it advantageous to provide a teacher's office in each instructional area. This office should be of large enough size to provide desk space for teachers in the department, for the discussion of the department program and storage of materials for classroom enrichment.

Teachers' Workroom

All schools should be provided with an area where teachers have access to materials and equipment for class preparation. This area may be located near the administrative area or near the library and should be so equipped that teachers may meet and prepare materials for class.

Other Facilities

In all schools it is desirable to have a large display window or case in the vicinity of the principal's office for the showing of topical displays, exhibiting student's work, and the like, to students, faculty, and visitors. Other display cases or windows should be distributed throughout the building.

In accordance with the type of program and the size of the school, other facilities may be needed in the administrative area, such as: the assistant principal's office, the attendance office, and the supervisors' office.

Storage

It is important that adequate storage be located throughout the building -- in the classroom for the teachers, as well as space for the administration, library, lunchroom, custodial services, athletic department, and other special areas.

INSTRUCTIONAL AREAS

The present-day high school educational program requires many different types of instructional areas. The academic subjects require a standard or academic-type classroom. Other subjects require more specialized spaces and equipment which demand special consideration when facilities are being planned.

This section of the guide deals with these more formal types of instructional areas. The informal- or activity-type area will be discussed in a later section.

Standard or Academic Classroom

Subjects usually associated with the standard or academic classroom are English, mathematics, and social studies.

It is recommended that these classrooms be designed to accommodate a maximum of 35 students with 25-28 square feet per student. All standard classrooms should have a minimum of 750 square feet. Dimensions should approach a square shape since this seems to provide more appropriate teaching space than those limited in width. (A width of 24 feet is considered minimum with 26 feet or 28 feet preferred.) Rooms of other shapes, i.e., octagonal, hexagonal, or pie-shaped also have been satisfactory if carefully planned.

The academic classrooms are often planned and constructed without regard for the needs of instructional equipment in the various subjects to be taught. Each classroom should have provisions for storing, mounting, or otherwise handling the equipment to be used in all subjects taught in that classroom.

> SPECIAL NOTE: In many schools certain classes are traditionally small. For this situation, the use of one or more half-classrooms, or provisions to divide one or two classrooms into half-sized rooms, may be considered. A teaching or lecture area that will accommodate two or three classes at once should be considered.

Specialized Instructional Area

There are many instructional areas in a secondary school which require special attention during the planning stage. The number and extent of these areas will be determined by the number of students in the course, the school program, and the financial ability of the district. The following are areas or subjects which fall into this category:

- Library
- Business (Commercial) Department
- English Language Arts Department
- Science Department
- Fine Arts Department
- Foreign Language Department
- Industrial Arts Department
- Health and Physical Education Department
- Vocational Education Department
- Special Education Department

1. Library

The library unit should be recognized as being the center of the instructional program in modern schools. The school library serves as a teaching center for many kinds of teaching aids and materials for students and teachers. It also serves as a research center for student projects, individual or in groups -- as a materials center for the faculty -- and as a multipurpose area for conferences, discussion groups, class activity meetings, film projection, and other uses.

In addition, the increasing use of instructional media makes it necessary to provide a suitable area for their storage, indexing, and distribution. These activities can be handled more economically and functionally through the school library.

If the library is to serve as the instructional program center, it must be carefully planned as to location, components and their size, and services to be rendered. Proper acoustics, lighting, and ventilation also need to be considered.

a. Location. The library unit should be centrally located, but isolated from all areas of "noisy" activity such as band, choir, gymnasium, shops, and lunchroom.

b. Components of the Library. School libraries should be planned to include as many of the following components as possible or as needed. For some schools it may be necessary or desirable to combine two or more of these components in one space. Other schools may find it necessary or desirable to provide additional areas.

- Reading Room
- Librarian's Office
- Workroom
- Conference Room
- Faculty Materials Center and Lounge
- Instructional Media Room
- Multipurpose Classroom

(1) Reading Room. The reading room should be designed to seat 10 to 15 percent of the school enrollment. The maximum capacity for one reading room should be 100 students. If more space is required, an additional room should be provided. For adequate placement of furniture and equipment, 30 to 35 square feet per student should be allowed.

Book shelving should be located around the perimeter of the room for access to the students. If the number of volumes requires more than the wall shelving, additional "stack" shelving should be located in the reading room, well spaced and located for easy supervision by the librarian.

NOTE: To estimate the amount of shelving needed, eight volumes per foot or 24 volumes per three-foot section of shelfing should be allowed.

For proper supervision and control, entrances to the reading room should be near the circulation desk. It is advisable to keep the number of entrances to a minimum.

The preferred height of the window sills in the reading room is generally 36 to 42 inches above the floor to permit additional shelving under the windows and reduce outside distractions.

(2) Librarian's Office. The space designated for the librarian's office should be near the circulation desk and the entrance(s) to the reading room. It may be a private office or located within the workroom. In any case, it should be so planned that the librarian has complete supervision of all library areas.

(3) Workroom. A separate workroom adjoining the reading room is a basic part of the library. The size will vary according to the size of the school and the amount of storage space provided elsewhere; however, the minimum size should be 11 feet by 14 feet. This room should have a work counter with sink, storage cabinets, work table, corkboard, files, and such other equipment as required in order to receive, index, repair, and maintain all library materials. In some schools an area for the librarian's desk and file cabinet will be designated in the workroom in lieu of a separate office.

(4) Conference Room. One or more rooms should be provided for conferences, group study, and committee meetings. These rooms may connect directly with the reading room separated by a glazed partition. The conference room should be large enough for eight or ten people with a long table and chairs or at least 10 feet by 12 feet as a minimum. If two of these rooms are provided, they might be connected by a removable partition for conversion to one room, as the occasion demands.

(5) Faculty Materials Center and Lounge. A private area for the faculty, as a part of the library center, containing curriculum materials, professional books and magazines, and which can function as a lounge, will prove to be useful. This area need not be large, 120 to 150 square feet minimum, but should be furnished for relaxation, conversation, or use of the professional materials. Restroom facilities for both men and women should be nearby, but not open directly into the faculty center.

(6) Instructional Media Room. With the increased use of a great many types of instructional media, it is important that a place be planned for their safe keeping. This room should be suitable for reviewing films, filmstrips, records, or tapes. All materials stored in this area should be distributed and their use controlled by the librarian. The minimum size of the room should be 10 feet by 12 feet.

(7) Multipurpose Classroom. This room should be equal to a standard size classroom with an entrance into the reading room, as well as into the corridor. It should permit the use of the library materials by an entire class without disturbing other library users. It can also serve as an audio-visual viewing room, and no doubt have many other uses.

c. Combination of Areas. It is recognized that not all schools will be able to provide all of the individual components listed above, but the list presents a goal toward which all schools should plan and accomplish if possible. This can be done by planning a combination of areas, multiple use of some areas, or such other modifications as circumstances require.

Some schools, which have found it necessary to combine the library and some other facility, have utilized the cafeteria dining room as the library reading room with some library facilities added to this area.

2. Business (Commercial) Department

The list of subjects approved for this category include:

- Typewriting I and II
- General Business
- Business Arithmetic
- Business Law
- Salesmanship
- Shorthand I and II
- Bookkeeping I and II
- Clerical Practice
- Stenographic Practice
- Business Machines
- Business Office Experience
- Business Communication
- Business Organization and Management

Subjects which will need special facilities are:

- Typewriting
- Shorthand
- Bookkeeping
- Stenographic Practice
- Clerical Practice
- Business Machines
- Business Office Experience

Classes in all other subjects in this department can be conducted in a standard, academic-type classroom.

a. Location of Facilities. The rooms for all related business education subjects should be grouped. If the same typewriters are used for both transcription and typewriting classes, the shorthand room should adjoin the typewriting room.

b. Size of Room. For academic classrooms, see Item 3, page 51. For rooms requiring special facilities approximately 40 square feet per student for 40 students should be allowed.

c. Other Considerations

(1) Artificial lighting should provide 50 to 100 footcandles properly diffused.

(2) Ceilings and/or walls should be treated acoustically to reduce noise in rooms where machines are used.

(3) Adequate electrical outlets should be provided for electric typewriters, adding machines, and calculators. Outlets should be flush with the floor and spaced so that electric cords are located under desks or tables.

(4) Adequate storage facilities should be planned in accordance with the curriculum for the teachers' supplies and for individual students.

(5) Adequate chalk and tack boards installed.

3. English Language Arts Department

The list of subjects approved for this department are:

English Language Arts, Grades 7-8
English I -- IV
Speech I -- IV
Drama I -- III
Journalism I and II

Classes in all of the above subjects except Speech and Drama can be conducted in a standard academic-type classroom.

a. Location of Department. The group of rooms for this department should be located in the academic area of the building.

b. Size of Rooms. The speech room should be slightly larger than an academic classroom to allow for a small stage at one end, which need not be an elaborate installation, but should have a small wing on each side and an inexpensive curtain. The depth of the stage need not be more than eight or ten feet.

For drama, the room should be about twice the size of that of other classrooms in order to provide rehearsal space and flexibility of arrangement.

4. Science Department

All science rooms, grades 7-12, should have adequate space for storage of instructional materials and for a wide range of activities. For individual and small-group experimentation in grades 7-8, outlets for water, gas, and electricity, and provision for disposal of wastes are required.

Facilities for the science program in grades 9-12 should provide for individual pupil experimentation with equipment and materials for each course.

The list of subjects approved for this department are:

Grades 7-8

Life Science, Earth Science, and General Science

Grades 9-12

General Science, General Physical Science, Biology I and II, Chemistry I and II, Physics I and II, Advanced Science, and certain special science courses.

The extent of science facilities required to meet the accreditation standards of the State is determined by the size of the school, the student enrollment in science classes, the financial ability of the district (with or without federal assistance), and the method of programing the use of the facilities.

The Principles and Standards for Accrediting Elementary and Secondary Schools, adopted by the State Board of Education in September, 1961, make it possible for a student to earn one of the two required science credits in the seventh and eighth grades. This program continues the sequential development of scientific concepts begun in the elementary science program, and is designed to introduce pupils to the laboratory method of problem solving rather than beginning the more formal nine- to twelve-grade program of individual experimentation and research. Thus, the formal-type laboratory is neither needed or required. Minimum standards can be met in a regular classroom modified to provide space for pupil and teacher demonstrations, counters or tables for project work, storage for simple apparatus and equipment, and bulletin boards for display purposes.

High School Science Facilities (Grades 9-12). The State requirements for graduation from accredited high schools specify that science in grades nine through twelve be taught by the laboratory method. To meet this requirement, all high schools must have suitable science facilities. Again, the extent of these facilities will be determined by the size of the school, the number of students involved in the various science courses, the financial ability of the district, and the method of programing.

Many schools are using a multipurpose science room, which combines into one room, the laboratory and classroom facilities for more than one science. This practice calls for more square feet of area for each student, but is still less than that required for the two-room plan. In this type of room, the fixed equipment is located around the perimeter of the room, leaving the central floor area available for suitable science furniture.

Larger schools find it necessary to provide single-purpose science rooms, each equipped for teaching only one science. The science program and enrollment will determine whether these rooms are combination laboratory-classrooms or whether separate classrooms will be equipped.

Size of Science Rooms

a. Laboratories. Laboratories should be designed for a maximum of 30 students. In order to provide suitable storage and preparation areas, it is suggested that from 50 - 60 square feet per student be provided.

b. Class or Lecture Rooms. Science class or lecture rooms should be the same size as standard academic classrooms. Rooms of this type should be equipped with a teacher's demonstration table.

c. Multipurpose Science Rooms. In most schools it is desirable to increase the size of the science laboratories and make them multipurpose science rooms. In this room, the fixed science equipment should be located around the perimeter leaving the central area open for lectures or other types of science equipment. Rooms of this type require a large area, but less than that of two rooms, and the possibility of rooms that are vacant is eliminated. For multipurpose science rooms, plus necessary storage areas, it is suggested that from 60 to 70 square feet per student be provided.

d. Special Considerations. There are many items in planning a science area which must be given special consideration, such as types of floor covering, kind of paint used, special utility services, ventilation, special work surfaces, and other requirements.

In the case of climate-controlled facilities, the science suite should be equipped with a separate air conditioning system. This will prevent the disbursement of unpleasant odors throughout the building and the contamination of equipment outside the science department.

e. Science Teacher Offices. Because of the presence of chemical fumes and odors, it is extremely important that the science department be provided with office space for the teachers. This will enable them to get away for a breath of fresh air between classes.

5. Fine Arts Department

The fine arts program has two distinct parts. One program is classified as Art Education and the other as Music Education. Both programs call for special facilities.

a. Art Education. The physical facilities for this program require a special room with work tables, sink, and other equipment appropriate for the various phases of art instruction. A major item in the list of needs for this department is ample storage space for the variety of materials used, for safe keeping of student projects, and for hanging students' protective clothing.

b. Music Education. The physical facilities for this program should be planned according to enrollment and extent of the program. In planning these facilities, special consideration should be given to the shape, size, and location of rooms, as well as acoustical treatment, lighting, ventilation, and needed equipment. Acceptable rehearsal rooms for choral and instrumental music:

- have 20 percent more cubic feet of air space per student than an ordinary classroom.

- are shaped to accommodate semi-permanent, semi-circular risers.

- are in a location that is easily accessible to the auditorium stage, but away from other classrooms
- have acoustical treatment that reduces excessive reverberation without overly deadening the sound
- have a ventilating system that provides continuous air changes without carrying sound to other classrooms.

Other facilities are:

- adequate storage space for instruments and uniforms, free from dampness and extreme temperature
- soundproof practice rooms at least six feet by eight feet
- space for music library filing cabinets and sorting racks.

The other music courses will require a standard classroom with regular desks and chalkboards. In addition, piano and tape- or record-playing equipment are needed.

6. Foreign Language Department

The approved foreign language program includes courses in both Latin and modern foreign languages. Since both types of language courses are academic in nature, they are usually taught in a standard classroom, but schools now are also using the language laboratory. The "language laboratory" is a room where recording and playback equipment is used as a teaching aid. The development of this type of teaching came about as a result of the success achieved in teaching foreign languages to members of the armed services during World War II.

a. Location of Language Laboratory. The language laboratory should be located in the academic area of the building convenient to the library and instructional materials center.

b. Size of Language Laboratory. The size of the language laboratory will be determined by the number of "student stations" and the type of equipment to be installed. In order to provide adequate clearance around equipment, it is recommended that 30 to 35 square feet per student station be provided. Space should be provided for a large table where a group of 10 to 12 students can be doing textbook or other work while other members of the class are working with the tape machines.

SPECIAL NOTE: A fallacy which has developed over the years is that the use of the language laboratory is restricted to the exclusive use of teaching languages. Such equipment can be effectively used for many other subjects, i.e., English, speech, business subjects, mathematics, history, and others. Limitations on the use of this equipment are determined only by the extent to which programs are provided.

7. Industrial Arts Department

Industrial arts is a general-education subject area designed to prepare youth for effective living in our industrial society. Many of the courses are especially helpful for the terminal student because they provide a foundation for technological training outside the public schools.

Inasmuch as the industrial arts program covers a wide variety of subjects involving specific types of equipment and technical skills, the physical facilities should be adequate for those courses being offered. In general, these facilities will consist of various types of shops and drafting rooms.

8. Health and Physical Education Department

The health-education phase of this category is academic in nature and can be taught in a standard classroom. It is more convenient to use a classroom located near the gymnasium since the course often shares a period during the week with physical education. The facilities for physical education will be discussed in a later section under the heading of Activity Areas.

9. Vocational Education Department

The approved program for high school vocational education includes courses in:

Vocational Agriculture	Industrial Shop
Distributive Education	Industrial Cooperative Training
Homemaking	

Physical facilities should be provided for each of the courses the school system plans to conduct.

a. Vocational Agriculture. A standard classroom should be provided with sufficient floor space to accommodate the class with the largest group of students enrolled. In multiple-unit departments, a classroom is provided for each teacher. Office space, storage room, library space, bookcases, magazine racks, bulletin boards, filing cabinets, tables, chairs, and teacher's desk are located in or adjacent to the classroom. Textbooks, reference material, visual aids, instructional materials, and equipment appropriate for the various areas of instruction in vocational agriculture are provided in accordance with standard facilities and instructional aids approved by the State Department of Education.

A farm shop adjacent or closely located to the classroom is provided which will contain a minimum of 1800 square feet of floor space or 100 square feet of floor space per student if the largest class exceeds 18 students. The farm shop has standard lighting, heating, ventilation, and electric facilities in accordance with standard facilities approved by the State Department of Education. Washrooms, showers, lavatories, and storage facilities should be provided adjacent to farm shop.

Type and quantity of hand tools and power equipment essential in teaching basic skills in all areas of farm mechanics are provided in accordance with standard facilities approved by the State Department of Education. When planning this department, the Area Supervisor should be consulted.

b. Distributive Education. A standard classroom with tables and chairs, chalkboards and bulletin boards, book shelving, filing space, and space for storage of supplies is recommended. When necessary, distributive education classes may share a classroom with other subject areas.

c. Homemaking. The Homemaking Department should be planned to take care of all phases of this course and include more than cooking and sewing equipment. When planning this department, it is recommended that the Area Supervisor be consulted concerning needs and layout for the specific school plant concerned.

d. Industrial Shop and Industrial Cooperative Training. In general, these programs will be limited to the larger school districts which have local industry and business available that are willing to cooperate in the program. It is recommended that schools planning to conduct classes in these programs write to the Division of Industrial Education, Texas Education Agency, Austin Texas for detailed information on facilities.

10. Special Education Department

The facilities to be provided for special education will be determined by the type of program to be conducted and the number of children involved. In giving consideration to these facilities, local schools should make a thorough study in consultation with the Division of Special Education, Texas Education Agency, Austin, Texas.

ACTIVITY AREAS

The areas considered in this category include the:

- Cafeteria
- Gymnasium
- Auditorium
- Outdoor Areas

The first three are probably the most expensive elements within the school plant. This is because these units should be planned initially for maximum capacity since future expansion is difficult. Serious thought, therefore, should be given to the planned uses of these spaces for the future as well as present needs. Otherwise, it may be difficult to justify the proposed size and expense, or even include one or more of these areas in the proposed school.

It is a matter of local decision to determine whether elements such as the auditorium, which is largely a community facility, should be included in the school plan. In many cases an existing community building serves the needs of both the community and the school, thus relieving the school from the expense of building duplicate facilities.

1. Cafeteria or Cafetorium

With the high cost of construction and with schools needing more and more space, it becomes necessary for most schools to make multiple use of some areas. One such area is the dining room of the school cafeteria. When this space is provided with a stage and is used in lieu of an auditorium, it is commonly referred to as a cafetorium. With proper concern for acoustics, lighting, and ventilation, this area can very well serve in both capacities and result in considerable savings on building costs.

In developing plans for this facility, the following should be considered:

a. The size of the various elements of the cafeteria will be determined by the size of the school and the number of lunches served to students. Planners should bear in mind that six to seven lunches is the maximum served per minute and should plan serving facilities accordingly.

b. The size of the dining area is determined by the maximum number of lunches served per shift. The space required is ten to twelve square feet per student. Chilled drinking water should be provided and cross traffic of serving line(s) and exit from dishwashing station avoided.

c. The kitchen and service areas should contain five to six square feet per lunch served per day.

d. The total cafeteria area (kitchen and dining) recommended based on the total number of lunches served per day is:

100-500 lunches per day -- 11.5 - 12.5 square feet per lunch
500 or more lunches per day -- 10 square feet minimum to 11.5 square feet per lunch.

e. In the interest of better health habits and in keeping with the health program, it is recommended that a two- or three-spigot handwashing station be located at the entrance of the food-serving line. This permits the teacher to supervise and make certain that all children in the class wash their hands before being served.

f. Special attention should be given to:

(1) The provisions for handling the soiled dishes, silverware, and milk cartons.
(2) The location of trash or garbage cans so as to avoid floor and wall stains and unsanitary conditions. It is suggested that an area for garbage and trash be recessed four to six feet into the kitchen and be provided with folding doors to conceal the area when the dining area is being used for other functions.

g. In schools that plan to use the dining area in lieu of the separate auditorium, the kitchen should be located at the opposite end of the room from the stage and should be planned so that it can be closed off from the assembly area.

2. Gymnasium or Gymatorium

The gymnasium is another area which can be utilized for public or school gatherings in lieu of an auditorium. If it is planned as a gymatorium, the stage should be so located that the folding bleachers, installed for basketball spectators, can be fully utilized for functions on the stage. If this area is to serve successfully for auditorium activities, the design of the acoustical treatment is an important consideration. It is less expensive to give a gymnasium good acoustical treatment for use as an auditorium than to build a separate auditorium.

When planning a gymnasium or gymatorium, the following should be considered:

a. The gymnasium should be designed primarily to meet the needs of the total physical education program as outlined in the Texas Education Agency Bulletin 615. The needs for school athletic events should be considered secondary to the needs of the physical education program.

b. Public seating should be provided by installation of folding bleachers which occupy a minimum amount of space when not opened.

c. Dressing rooms for both boys and girls should be sanitary, well ventilated, and adequate for proper storage of equipment of all students enrolled in physical education.

d. Dressing rooms for athletic teams should be separate from the physical education dressing rooms and should be sanitary, well ventilated and equipped for the proper care, drying, and storing of athletic equipment.

e. The gymnasium should be designed so that it can be used by the public without opening the remainder of the school.

f. Ticket booths, concession stands, public toilets, and the like, should be accessible from the main entrance lobby for control of public traffic. Ticket booths, concession stands, and other items, which have limited use, might be portable.

g. The installation of folding partition across the main floor to provide separate areas for boys and girls is considered an unnecessary and needless expense.

3. Auditorium

A careful analysis should be made of the local educational and community needs for an auditorium as the basis for decisions as to whether or not one should be built and what its characteristics should be. In designing an auditorium there should be a definite understanding by all concerned of the functions the auditorium is to perform.

The size of the auditorium will be governed by

- size of the school
- school policies and program
- extent of community use
- availability of other facilities in the community.

From the standpoint of school use alone, a small auditorium seating one half of the expected maximum enrollment and an adequate stage, may have greater functional value than a large auditorium. Needs for large crowds may be met by other community facilities or by temporary conversion of the gymnasium.

4. Outdoor Areas

Outdoor areas to be planned as a part of the secondary school plant include both instructional and noninstructional areas. Instructional areas should be planned in connection with related areas in the building, such as those for physical education, science, and shops. Noninstructional areas which include faculty, student and public parking, and service drives should be located so as not to interfere with the instructional areas or traffic of students going to instructional areas.

MISCELLANEOUS SERVICE AREAS AND ITEMS

All areas within the proposed school plant plan should be thoroughly studied for adequacy. This applies with equal importance to the non-educational or service areas and items as well as the educational areas. Areas and items considered under this category should include:

- Toilet Facilities
- Drinking Fountains
- Corridors
- Lobbies or Vestibules
- Exits
- Custodial Service Areas

1. Toilet Facilities

a. Toilet facilities should be centrally located to serve the classrooms and other activity areas. Separate facilities should be provided for the teachers.

b. The following fixture count is recommended:

GIRLS	(One water closet per 35 (One lavatory per 30
BOYS	(One water closet per 60 (One lavatory per 60 (One urinal per 30

c. Fixtures should be so located that lavatories are near the toilet room exit but water closets are far from the exit. To avoid congestion, toilet rooms should not contain more than five of each fixtures.

2. Drinking Fountains

One drinking fountain, preferably cool or chilled water, for each 50 students should be located near teacher work stations. Drinking fountains should also be located near the outdoor physical education teacher stations.

3. Corridors

All corridors should be designed to handle maximum traffic from the adjoining rooms. Corridors should be wide enough to permit a rapid and orderly exit from all rooms served in the event of an emergency. In general, major interior corridors should have a minimum width of eight feet of clear traffic space free of projecting doors or other objects. Other corridors should be designed according to the number of students served and the distance to the nearest exit. No corridor should be planned which reduces in width the direction of traffic flow toward the exits.

4. Lobbies or Vestibules

All lobbies or vestibules should be designed to receive the traffic from converging corridors or other areas served and to discharge traffic to the outside with a minimum of congestion or confusion.

5. Exits

In many areas of the State the size, number, and location or maximum travel distance are established by local building codes. In areas which do not have a building code, it would be advisable to use the code of the nearest major city as a guide. The requirements of the State law governing fire escapes from school buildings must be met.

6. Custodial Service Areas

a. Outside equipment storage. All school buildings having a campus that is maintained by the custodian should be equipped with a storeroom for the required equipment. The storeroom for outdoor equipment should be made more fireproof than the surrounding portion of the building because of the use of gasoline. The entrance should have a ramp so that mowers, etc. can be run directly into the room. Adequate racks for ladders, hose, sprinklers, shovels, wheelbarrows, etc. should be provided.

b. Inside custodial service closets. The temptation to save on providing this type of space should be resisted. In the first place they are too small to add appreciably to the cost of the building, and second, having them located conveniently and not too far away will encourage more and better work by the custodians. These closets should contain at least 48 square feet of floor area. A service sink and shelves or hangers for the care of brooms, mops, buckets, short ladders, scrubbing machines, etc. should be provided.

c. Custodial supply storage. Each building should be provided with a supply room for custodial and other plant operation supplies. It should be so located that it can be served by truck from the outside and should be designed to handle bulky materials and containers. This area should be of fireproof materials, also.

d. Wastepaper disposal. The largest single item of refuse in a school building is wastepaper. While many schools provide an incenerator in connection with the cafeteria kitchen, very few provide more than a tumbled-down, screened area in the backyard for disposing of the tremendous volume of waste-paper that accumulates every day. With good planning, small inexpensive, paper-burning incenerators can be provided in the major areas of the building where the wastepaper accumulation is the greatest. Often they can be installed as an adjunct to a custodian's service closet. The time saved by custodians in traveling to the backyard and back will go far in paying for these installations to say nothing of their being usable daily regardless of the weather.

e. Workshops. If the school district does not have a central workshop, each building should have a place where small furniture and equipment can be made. This should not be considered as a corner of the furnace room or in a storage room. It should be a space provided and equipped with work benches and tools to meet the repair demands.

OTHER BUILDING CONSIDERATIONS

1. Economical versus Cheap Construction

Because the cost of construction continues to rise and because schools are built with tax money, school board members sometimes are inclined to be over zealous in their efforts to cut or hold down on construction costs.

In order to avoid this, school districts should set standards of construction quality that will result in well-constructed buildings which are inexpensive but not cheap. They should be sturdy and economical but of materials that are easy to clean, maintain, and difficult to damage. Since school buildings are insured against loss from fire, storm, and other hazards, it is good business to have them so they will carry a very low insurance rate.

In this instance the term economical is used to denote well-designed, well-built structures of sturdy materials with no unnecessary frills or "gingerbread."

2. Buildings with Controlled Climate

Since 1960 there has been an increasing trend in the State toward the "climate-controlled", or so called "air-conditioned" school building. This is in keeping with the accepted practice of air-conditioned homes, offices, stores, churches, and automobiles. It is noteworthy that this trend is increasing in all sections of the State and in school districts of all sizes and varying financial abilities.

Experience is showing that a properly-planned, climate-controlled school building can be built for about the same cost as a conventional building. It is generally conceded that both students' and teachers' work increases and improves in a comfortable school building.

It is earnestly suggested that all school boards faced with new building needs give carful consideration to this type of building which offers an improved teaching and learning climate, eliminates the need of orientation for breeze and sun control, avoids the necessity of window shades, roof overhangs, or sun shields, and makes possible a more compact design with a reduction in construction and maintenance costs.

For boards which are concerned about air-conditioning one building while all of the other buildings in the system are not, it should be pointed out that every school district has to have a "first one." In general, the boards faced with this problem have found that the patrons are pleased to have one such school. After the new plant is in operation for a year or two, the school's patrons usually request the other plants be remodeled to include climate-controlled equipment.

3. Carpet Floor Covering

Some experimenting with carpet floor covering in certain areas of school buildings has proven to be very satisfactory. The carpet serves as an acoustical material -- the increase in original cost is offset by reduced maintenance and custodial costs -- and the psychological effect on the students has reduced discipline problems. It should be noted that carpet used in scools should be of commercial quality used in hotels and theaters, and not the type used in homes.

4. Prepare for Television

With the rapid increase in the development of educational television, it is recommended that, as a minimum, the necessary conduit be provided for future television installation. This should be done for individual rooms or certain assembly areas as determined by the local administration.

5. Lighting Value

a. Listed below are the "footcandle" lighting levels recommended at the working surface for various areas and activities.

(1) Classrooms
- general work ---------- 50 footcandles

(2) Library
- study and note taking -- 70 footcandles
- ordinary reading ------- 30 footcandles
- card filing ------------ 70 footcandles

(3) Auditorium ------------------- 15 footcandles
(4) Lunchroom and kitchen -------- 30 footcandles
(5) Stairs and corridors --------- 20 footcandles

It is of great importance that the above "footcandle" levels be uniformly distributed throughout the areas concerned.

b. To maintain good brightness ratios, the following list of reflective values for various surfaces are recommended:

Floors------30%	Ceiling-------85% to 95%
Walls-------50%	Window Walls--75% to 85%
Chalkboard--15%	Tackboard-----40%
Furniture---25% to 40%	Desk Tops-----40%

Since many visual difficulties result from glare and brightness, particular attention should be given to avoiding glossy surfaces on the desks, furniture, and other equipment and to prevent a bright-light spot within the visual field. Therefore, all lights in the 60^{o} visual field should be shielded and window-wall glare controlled with venetian blinds, glare-reducing glass, wide overhangs, or exterior louvers.

SIZES -- BUILDINGS AND AREAS

(Elementary School Entries Included for Comparison)

1. Suggested School Site Sizes

   . Elementary
     10 acres plus one acre for each 100 students

   . Middle (Junior)
     20 acres plus one acre for each 100 students

   . High School
     30 acres plus one acre for each 100 students

2. Suggested School Sizes

   a. Pupil capacity

. Elementary	500 - 750 students
. Middle (Junior)	900 - 1500 students
. High School	750 - 2500 students

   b. Square footage per pupil

   . Elementary
     60 to 100 sq. ft. -- Average 70 sq. ft.

   . Middle (Junior)
     70 to 115 sq. ft. -- Average 90 sq. ft.

   . High School
     90 to 135 sq. ft. -- Average 110 sq. ft.

   This includes auxiliary areas, passageways, etc.

   Room size for kindergarten and primary: 1000 - 1200 sq. ft.
   Room size for elementary: 900 sq. ft.

3. Suggested Square Footage Per Pupil Per Teaching Station

   a. Academic classrooms

. Mathematics	25-30 sq. ft.
. Journalism	25-30 sq. ft.
. English	25-30 sq. ft.
. Social Studies	25-30 sq. ft.

b. Activity or specialized subject areas

. Art	45 - 50 sq. ft.
. Commercial	
Bookkeeping	45 - 50 sq. ft.
Business Law	25 - 30 sq. ft.
Related Business Education	25 - 30 sq. ft.
Typing	35 - 40 sq. ft.
. Crafts	45 - 50 sq. ft.
. Industrial Arts	
Shop (min. 1800 sq.ft.)	100-110 sq. ft.
Mechanical Drawing	35 - 40 sq. ft.
. Language Laboratory	45 - 50 sq. ft.
. Library	
100-200 pupils---900 sq.ft.	
200-600 pupils--- 25 sq.ft. per pupil	
Over 600 pupils-- 30 sq.ft. per pupil for 15% of pupil population	
. Lunchroom (including kitchen, etc.)	15 - 20 sq. ft.
. Music	
Band (min. 2000 sq.ft.)	40 - 50 sq. ft.
Choir	30 - 35 sq. ft.
. Physical Education	
Dressing rooms	50 - 60 sq. ft.
Health classrooms	25 - 30 sq. ft.
. Science Laboratory	45 - 50 sq. ft.
. Special Education	35 - 45 sq. ft.
. Vocational	
Agriculture	
Shop (min. 1800 sq.ft.)	100-110 sq. ft.
Classroom	25 - 30 sq. ft.
Automechanics	
Shop (min. 2500 sq.ft.)	150 sq. ft.
Cosmotology Laboratory	90 sq. ft.
Distributive Education	25 - 30 sq. ft.
Homemaking	
Clothing	40 - 50 sq. ft.
Foods	40 - 50 sq. ft.
Industrial Cooperative Training	25 - 30 sq. ft.

The following areas should have a minimum of one and one-half times the square footage of a regular classroom:

Electronics laboratory (speech)
Science laboratories
Art room
Typing room
Shop areas
Arts and crafts

Adequate storage and display space should be given consideration. Few schools have either adequate classroom storage or display space. Large areas are needed for group instruction and machine teaching.